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# A Drifting Market

## Some December Rollings on Rails for 1911

## Unprecedented Stocks of Lake Ore—A Foreign Pool in Ferrosilicon

The iron trade is resigning itself to a period of drifting, with little expectation of early developments affecting either prices or orders. It is evident from the character of some recent new business that consumers of finished steel are running on scant stocks, and that mill operations now more closely measure the country's consumption.

The attitude of producers on prices was illustrated by the action of the sheet manufacturers at their Pittsburgh meeting December 8, which was the largest ever held. They decided that conditions do not call for any change, and that in the immediate future what has been the nominal basis should be made the actual basis of sales. It is familiar history that price maintenance is less difficult after a period of cutting in which buyers have generally supplied their wants for a period.

Rail contracts have been so much threshed over in anticipation that their value as a factor of encouragement is already discounted. The Pennsylvania order, with its condition of heavy discards from the rail bloom, has not yet been accepted. The New York Central tonnage, which is likely to be 125,000 to 130,000 tons, or more than has been counted on, likewise involves some questions of specifications. In two or three cases rail mills which would have been idle most of this month, have been given preliminary orders for early rolling, but applying on next year's contracts. The Ontario & Western has made some purchases, and has other orders pending. The Delaware & Hudson is in the market for 10,000 tons, most of which is expected to go to the Bethlehem Steel Company.

Car inquiries include 1500 to 2000 for the Buffalo, Rochester & Pittsburgh and 1000 for the Kanawha & Michigan. The Harriman lines is figuring on 153 locomotives, and the Boston & Maine is about to buy a considerable number.

There is still a good volume of structural work, but fabricating prices are so low that only the best equipped works can make a profit. The new Bureau of Engraving and Printing at Washington will require 4000 tons. The Pennsylvania Terminal Post Office in New York, 6200 tons, on which bids exceeded the appropriation, will be readvertised.

Three caissons for Government dry docks, one in Cuba, one in New York harbor and one on the Pacific Coast, will furnish much needed plate mill tonnage.

Prices on steel bars have not been strictly maintained at 1.40c., Pittsburgh, but the activity in this direction has not affected the large tonnage of contract business now on the books. A conference of bar manufacturers will be held in Pittsburgh, December 15. Plate manufacturers held a meeting there on Wednesday, December 14.

Tin plate manufacturers at a Pittsburgh meeting

December 14 declared for the continuance of present prices. Some irregularity in black plates has been a disturbing factor in the sheet market.

Low prices were brought out by two cast iron pipe lettings of the week—$24.35 per net ton for 3500 tons at Cleveland, and $21.38 for 1500 tons at New Bedford, Mass.

In pig iron the only question of moment is how soon the merchant furnaces will blow out enough capacity to put production below consumption. The idle list is growing more rapidly. The Steel Corporation blew out another Gary furnace this week. Northern foundry iron has been dull and drooping, but Southern producers are rather less inclined to take $11 business for the second quarter of next year.

The shipments of Southern pig iron abroad can scarcely be dignified as a movement. A recent sale of 300 tons for Italy was made by the Tennessee Company and for some time occasional small lots have been taken by Italian foundries.

Makers of 50 per cent. ferrosilicon in Europe have formed a pool and arranged for a 50 per cent. reduction in output, a capacity of 30,000 tons being included.

Iron ore stocks on Lake Erie merchant docks December 1 were 9,414,000 tons. It is probable that Lake ore in furnace yards, including those in the Chicago district, is more than double this amount, making a total close to 30,000,000 tons. This is probably the largest amount of ore that has ever been piled up ahead of the industry, and means that many consumers have all the ore they will need until late in 1911.

Pig tin reached a new high point for the year this week, at 38.55c.

## A Time for Finding Economies

The amount of prominence lately given to efficiency as a measure of successful industrial management is entirely in line with another development of the present slackening in business—the increasing application of the same test to the rank and file of workmen. In the news dispatches of the past week, it has been stated, that a large locomotive company will gradually reduce working forces unless locomotive bookings are soon increased. An officer of the company, referring to the labor situation at its works, said: "We are taking on and we are dropping a number of men. We have to hire about 500 men to get 100 good employees." The remark is an index to the sifting that is going on in many industries now that the supply of men is noticeably greater than the supply of jobs.

In 1908 the decline in business enabled many manufacturers to set up new standards of performance in the shop. It proved a good time for the introduction of premium and bonus systems and for the appraisal of the value of individual workmen. In the past two years, apart from the few lines directly affected last year by the excesses of the automobile industry, the pressure has not been such as to break down the new shop standards. And now, whether in partial response to an overwhelming demand at the polls last month for a reduction in the cost of living, or because forces which have been for some time at work for a readjustment are acting more directly than before, manufacturers are facing a time when labor union and other uneconomic restrictions will count less and less.

The railroads have been accused of many offenses against efficiency, but in 1908 they were credited with some very able contriving, after they had been debarred from reducing expenses by cutting wages. They found ways of doing more work with fewer men. Much of the advantage then gained was swallowed up in the wage advances of this year; but had it not been for the economies they were forced to learn in 1908 their net earnings in 1910 would have told much more heavily against the shippers' case.

Such savings in operating costs, as the railroads and the manufacturing industries must enforce in times like the present and those just ahead, are the natural remedy for what was becoming a serious vice—loading every waste and every deficiency of manager and workman upon the ultimate consumer.

## Two Routes to Lower Prices

When a certain billion-dollar Congress was attacked for extravagance, the answer was made that this is a billion-dollar country. The call for lower prices that has been gathering force will likewise encounter the argument that this is a high standard and therefore a high cost country. It will be found that some who are now most insistent for a lower level really want what they buy to come down, so that they can either buy more than at present or have a larger surplus income, or both. They are not advocating reductions in what they have to sell, whether labor or manufactured product.

The history of low-price periods in this country has been one of industrial depression and distress. Workmen have not complained in such times of the level of commodity prices, but of the difficulty of getting money with which to buy. The trouble has been that in getting low-priced food and clothing, which they wanted, they also had to take shortened hours and a small wage per hour, which they did not want. The present demand for more economy and more efficiency is not a call for low wages. But the question comes up whether a country used to the American scale of living can change in any orderly way and by the application of more "scientific" methods of manufacture and transportation to a basis which will be more generally popular. If we look to the conditions in other times of low prices for answer, we shall find testimony differing both as to the facts and their meaning. For example, the New York *Evening Post* makes this comment on the position of the steel industry as the result of the depression of the eighteen nineties:

> Prior to 1893 the country was proud enough of its steel producing industry. It doubted if any plants, more serviceable and efficient, could be found on any other continent. When the prolonged depression of the nineties came, we made some very unpalatable discoveries, both as to existing methods of production and methods of financing. Some people in the industry hinted that the Government ought to help them. Others sat down and wrung their hands, announcing that the country was going to the dogs. There were, however, others of that sturdy American type which is keen for innovation, which believes that industrial obstacles were made to be surmounted by enterprise and invention, and which assailed the problem with a comprehensive vigor which let no consideration of the smallest sort escape it. The result we know. That was in 1894 and 1896, and by 1899 we were driving England and Germany from the neutral export fields, and European public men were warning the world against the American invasion.

There is another view to be taken of the low prices which marked the years 1896 to 1898 in the American iron trade, and that is that the difference between that level and the level of to-day is almost wholly a matter of raw materials and labor. Mesaba ore at $1.80 to

$2 a ton, Connellsville coke at 90 cents to $1.10 a ton and common labor at $1 a day—which altogether would represent $7 to $8 less on a ton of iron than is paid for these three items to-day—measure the unparalleled distress accompanying that invasion of European markets by American steel. American engineering skill certainly was busy in that dark period, and the results have been of continuing value to the industry, albeit the investments demanded by the present engineering régime are enormous. But it was the sacrifice of ore and coal resources and the poverty of labor that chiefly advertised themselves in the American invasion of 1896 to 1898. With the latter-day basis of ore and fuel values and the present scale of iron and steel works wages, invention and scientific management will find it difficult to make reductions in cost that will at all compare with what are pointed to above as the achievements of 15 years ago. A clear distinction must be made between saving of waste and increase in efficiency as a way to lower prices, and the route which means a calamitous slaughter of labor and waste of unparalleled mineral resources. And this is by no means saying that a moderate middle ground for ore and coke values would be incompatible with prosperous conditions in iron and steel.

## Concerted Action on Workmen's Compensation

At a meeting of the Boston Branch, National Metal Trades Association, last week, prominent speakers dwelt earnestly upon the necessity of more general consideration being given by manufacturers to legislative matters. They urged particularly that the problem of workmen's compensation be taken up at this time, individually and collectively, by employers of labor, so that the strong impulse toward the general adoption of the principle in this country may be kept within safe limits. It is surprising how few business men have any real understanding of this great subject, yet, unless signs fail, most of them will taste the fruits of its growth in the near future. Some of the great associations of manufacturers, however, are giving it most earnest attention and have experts engaged in investigations, in the hope of arriving at conclusions which, embodied in statutes, will be equitable as between employers and employees.

The need of a change from the present unsystematic method of determining recompense to workmen who are victims of accident during their employment is advocated by many owners of industrial establishments. They hold that the liability of employers for accidents to workmen should be based on a system of universal compensation, regulated so as not to increase manufacturing costs inordinately. Such workmen's compensation laws as those of Great Britain work much injustice to the owners. Liability is altogether too general under the present interpretation of the British statute. The complications in connection with accidents of contributory partial disability of the employee, resulting from disease or previous injury, play too important a part in the cost of manufacturing. This is only one of the fallacies of the act. The British law compels no insurance of the workman against injury. Germany, whose system is held up by many as a model, requires contributions to the accident insurance fund from the State, the employer and the workman. The degree of paternalism is a question of no small importance; strong argument exists for minimizing this factor, that the independence of the American workman may not be disturbed. The compensation laws already enacted by some of the States leave much to be desired, as shown by the dissatisfaction concerning them. It is not proposed to discuss the merits of such laws at this time, but to emphasize the demand for greater active interest in the subject. The views of practical men are needed in the work. They are leaving too much to the theorists, whose ideas should be modified or corrected by the investigations of practical yet sympathetic business men.

## Keeping Labor in the Suburbs

Manufacturers whose works are in suburban neighborhoods, especially in sections that are growing rapidly because they are sought by industries requiring the same general class of labor, are troubled continually by the inability of their workmen to find satisfactory homes for their families or boarding places for themselves. To add hundreds of workmen each year to the population of such a place requires a much more rapid growth in the number of dwellings than is usually the case. Raising the standard of employment, by increasing the percentage of more highly skilled labor, creates another demand—that for better places in which to live. Various remedies have been tried, including houses built by the manufacturer for rental to his people and restaurants where they can secure their noon meals at low cost.

The Taft-Pierce Company, Woonsocket, R. I., which does contract work in metal and machinery, went at the solution of such a problem some months ago with much vigor. When running full, about 200 expert toolmakers are employed, which is a very great percentage of the total force. Much difficulty was experienced in keeping this highly paid labor, in spite of a liberal wage scale, because the men could find no satisfactory boarding places in the city, which is built about the textile industry. The company decided to establish a boarding house of its own, where men could get their meals at the current rate and rooms if they wished them. The result is an establishment which may be considered as a club rather than a boarding house. Situated in the industrial heart of the city, the building may be compared favorably with the average country club in the details of construction, furnishings and appointments, as well as in its cuisine. The rooms are occupied constantly by the men and the demand is for more of them. A great many of the employees, as well as the managing officers, use the dining room freely. When the conditions are compared with those of the boarding house of a mill town, they live in luxury. They are satisfied, and no doubt the experience of the first few months (the place was opened for business in July) will be accentuated as time goes on, especially when industry is rushing and the demand for high class machinists is constantly attempting to draw men away from such a force as that at Woonsocket.

Modern civilization has raised the general standard of living in this country and employers must take that fact into consideration if they are to maintain their working forces against the blandishments of competitors needing labor. If works are located where living conditions are unattractive, the manufacturer

must be the sufferer as well as his workmen. If he has to take steps which require the expenditure of money in order to keep his men, the investment is a good one, if the undertaking is worked out intelligently, having due regard to the kind of people which the effort is intended to affect. If the end is secured, the expense and trouble are made up many times over in the industrial results.

# Correspondence

## Efficiency and Lower Prices

*To the Editor:* Louis D. Brandeis of Boston, a man of much public work and public spirit, has recently laid us under obligations by formulating a plan for meeting a crying need of the hour. In addressing the Interstate Commerce Commission in Washington he struck the keynote as follows: "As an alternative to the practice of combining to raise rates, and hence to increase prices, we offer co-operation to reduce costs and hence to lower prices." Mr. Brandeis' topic on that occasion was railroad freight rates, but his proposal is of much wider applicability.

It has always been plain, and recently has often been stated, that the process of jacking up in rotation the various elements of the cost of living, which has been in progress for some years, could not go on forever. It was felt in a general way that "what goes up must come down," but Mr. Brandeis is the first, so far as I have observed, to propose a wide co-operation to that end. His aim, as I understand it, is to establish some measure of equilibrium between income and outgo by reducing expense instead of keeping to the heretofore popular policy of crowding up prices—a policy which he indicated in referring to the "vicious circle of ever increasing freight rates and ever increasing cost of living." Co-operation is the essence of Mr. Brandeis' suggestion, for it is clear that no one institution or class of institutions in commerce, industry or transportation can effect anything adequate in price reduction. All will have to work together. But it is necessary to begin somewhere, and as labor is the foundation of nearly all costs it furnishes the logical starting point.

### LACK OF LABOR EFFICIENCY.

Wages are assumed to be the chief factor in labor costs, but within pretty wide limits efficiency is of equal importance. Lack of labor efficiency is recognized as one of the serious economic problems of the time and as a terrible price hoister. Labor inefficiency is of two sorts. On the one hand, that for which the employers are accountable, like defective shop equipment, methods of supervision and failure to maintain the best relations with workmen which can be established; and, on the other, that which must be laid at the door of the men themselves or of the unions. To prepare for effective co-operation, the employers might well subject their plants and systems to renewed and rigid scrutiny and clear them of all faults which contribute to inefficiency of labor, as indicated in two recent and very interesting letters from Max H. C. Brombacher in *The Iron Age*, while the men might advantageously seek to gain the broadest view of their work and its results.

As a motive for this broader view, it is not needful to invoke altruistic sentiment on the part of the operatives. Enlightened selfishness should prompt them to their best effort. No class of our people complains more bitterly of the high cost of living than the working forces of industry and transportation, and none perhaps has contributed more to raise prices. They have pressed for a shorter and shorter day and have fought for, and usually won, higher and higher wages. They have also in numerous cases added to the burden of cost imposed by their victories, by allowing their efficiency to run down along with their decreasing hours of labor, or in inverse proportion to their increased pay. This latter factor of high prices the men ought to proceed to eliminate at once in their own interest, just as the employers should eliminate their promotion of inefficiency through reduction of piece work prices, as indicated by Mr. Brombacher.

### LABOR LEADERS SHOULD MODIFY THEIR ATTITUDE.

John Mitchell does not favor too much efficiency, according to newspaper reports. He objects to the specialization of labor beyond a certain point, and says: "Organized labor is against the premium or bonus system of payment for workmen because that is designed to speed up the workman beyond the safety line. That is bad economy." "It is sometimes charged," says he, "that labor unions tend to level down workmen. This is not true. Labor unions do not say that employers shall not pay a perfectly competent and efficient workman something in addition to what he pays the others." These quotations from one of the most respected leaders of organized labor indicate an attitude which will have to be modified if there is to be co-operation for lower prices. Such co-operation does not necessarily call for any general reduction in the amount of money received by workmen. Most people indeed would be glad to see this amount increased. But it does call for the removal by labor itself of all the props which support laziness and inefficiency. Mr. Mitchell's real contention seems to be that the employer should pay the many-times-raised schedule to the veriest dub in the shop, and that whenever an operative shows symptoms of a willingness to do a fair day's work he should immediately be rewarded by extra pay. Even then Mr. Mitchell objects to bonuses on the ostensible ground that it speeds the willing workman up too much for his health, but one involuntarily suspects that the real reason is because such speeding up throws the inefficiency of the scale-paid dub into too sharp relief and may even result in his discharge. Specialization and unrestricted earnings at a fair rate would seem fair to everybody.

### THE EIGHT-HOUR WORK DAY TOO SHORT.

But there is another way in which labor can co-operate for lower prices, not only without loss but with decided gain. One of labor's victories above referred to has been the progressive shortening of the work day in many lines to eight hours. I question the advantage of this victory to those who won it, but there is no question of its disadvantage to the employers, and to the nation viewed as an economic unit. There must be no such thing as a procrustean work day to which all trade should conform. Some occupations are less and some more exhausting, and the hours of labor must be governed to some extent by these characteristics; but in the majority of trades a nine-hour day is not too much for the health. I think experience has proved that in a large majority of cases the extra hour which the workmen have deducted from their productive period is not so used as to increase but rather to decrease their working efficiency. A return to the nine-hour day in many occupations without any reduction in the present hour or piece wage would have a salutary effect from several standpoints.

It is obvious that every extra piece turned out during a day pulls down the cost of the day's product by reducing the overhead charge on each item. Therefore, if the individual workman were allowed to earn more money and at the same time reduce the total per piece cost of his product, it would push down the cost of living and help the nation in its efforts for more business in competition with other countries. That competition is going to become more keen seems quite certain. The high tariff is now in its last period. Even the strongest of the stand-patters are becoming convinced that tariff revision cannot be long postponed and that it will not be upward this time. It behooves us to set our house in order and to get the prices of that which we have to sell on a level where we will be able to meet Europe in the markets of the world, and to reduce the cost of living to our own people. To accomplish this without forcing down the rewards of labor requires co-operation for lower prices by the removal, on the one hand, by the employers of bad equipment, bad management or restriction of earnings, and on the other hand, by the aban-

dowment of premiums on inefficiency, or insistence upon an uneconomically short work day on the part of the associations of labor. CHARLES T. ROOT.

## The Education of Labor

*To the Editor:* Permit me to trespass upon your space in order to explain and to amplify the remark I made in my letter of December 5, anent the possibility, desirability and necessity of our educating our labor (unions). As the cost of living impresses itself upon their minds automatically, it follows that the first thing which an employer should take the trouble to make clear to his men is that, in the long run, to shorten hours is to raise the cost of living. That cutting down production is bound to raise prices is understood by very many; that shortening hours is only another form of decreasing production is not understood by so many. Having made these facts clear to his men, it is not so difficult to make clear to them that, in the long run, the way for them to attain their desired goal of decreasing the cost of living is to increase their efficiency, *i. e.*, their output.

EFFECT OF SHORT HOURS AND CLOSED SHOP IN THE BUILDING TRADES.

How shortening the hours of labor results in increasing rents has lately been pointed out by a report in regard to the effect of short hours and the closed shop in the building trades. Obviously, a house built upon the basis of the eight-hour day, with a wage rate based upon equalizing the loss of time entailed by the closed season (winter), as well as by inclement weather in the open season, is bound to cost much more than a house built upon a schedule of longer hours. The increased cost of building the house is taken into account by the assessors for taxing purposes, of course. The net result is an increased rent which labor pays. That "labor pays" is what very few of the men understand. But for that matter, and as indicative of relative intelligence, the number of house owners who understand that the occupier (renter) pays is not exactly legion either.

To any one who, from the beginning, has been taught that nature, in the last solution, invariably premiumizes efficiency and penalizes inefficiency, that it knows nothing about "getting something for nothing," and that it knows nothing about equality anywhere, there is nothing mysterious about the fact that cutting down efficiency—*i. e.*, output per capita or per machine or per acre—invariably results in increasing the cost of living; and that wage increases seldom square the increased cost of living produced by these attempts to, so to speak, "stand nature on her head."

People grounded in these elementals understand, further, that commerce—*i. e.*, labor— is the basis of national life and growth; hence, that the nation which starts out to shorten hours of labor, without the concurrence of its principal competitors among commercial nations, is bound to lose out in the race for the world's business; it finds its commerce diminishing, hence its means of employment for its artisans diminishing. The end is that an unavoidable necessity arises for reducing the wage rate. This process is inevitable; so inevitable that one wonders at the blindness of the labor unions in agitating continually for shorter hours.

NATURE'S LAWS RELATIVE TO ECONOMICS ARE GENERAL.

It is known of all men that Germany and America are outstripping England gradually but surely in the race for the world's business. It is also well known that England is that nation in which the peculiar principles advocated by labor unions have had fullest sway. Cause and effect, from the standpoint of economics, never had a plainer illustration; a blind man can see the end if that policy be persisted in. And let no one delude himself with the idea, some years ago advanced with regard to bimetalism, that there is an American system of finance, therefore an American law of economics. There may be an American misapplication of nature's laws relative to finance and to economics.

This latter possibility is indicated by the case recently pointed out by the *Sun*, where a Congressional bill carried a clause forbidding the use of power presses already purchased and paid for. The object of this "rider" was to necessitate hand labor; the result was a loss of over $750,000. It seems to me that the most benighted unionist ought to see that this loss was out of all proportion to any possible benefit to the employees affected; that if it was desirable or necessary to coddle that particular form of labor, it would have been both cheaper, as well as more defensible from an economic standpoint, to pension the whole outfit. This would at least eliminate the stigma of this country prohibiting the use of machinery. That a country like ours, which has built itself up and prides itself on the advantages of using machinery, should thus ignorantly legislate against the use of machinery beggars belief.

That an appropriation bill carrying such a rider should pass both Congressional houses is an instance of coddling inefficiency, which one would not expect even from an economic or sociological mollycoddle. He would see that justice would require the extension of this discrimination against the use of machinery to all departments, and legislators ought to see that either such extension of discriminations against the use of machiery should be enacted or the ban should be lifted in this case. Incidentally, we are in no sort of shape to throw away the amount of money involved; and if there ever was a time in which our Government needs to set its people an example of sound economics and economical government, now is the time.

LABOR PAYS FOR ALL ATTEMPTS TO DEFY ECONOMICS.

Were our labor instructed in the principles of sound economics, it would not stand for this sort of thing; would recognize that labor itself pays for all such attempts to "get something for nothing" and to discriminate against the general application of sound economic principles. It would, of course, be far better, as a matter of fact, were these elemental truths drummed into our children in our schools, instead of being fed upon a curriculum based upon the fallacy that "all men are equal"; hence, that one (educational) bill of fare is applicable to all children of a given age. Absorbing food without digesting it results in dyspepsia, and stuffing into a child education (knowledge) which his powers of digestion are not equal to assimilating results in mental dyspepsia. Of the two, physical dyspepsia is the least harmful by far, and mental dyspepsia is sometimes known as "half-bakedness." Our system of education is an immense success as a producer of mental dyspepsia; it is responsible for much of the foggishness in regard to what liberties we take with the laws of nature.

Woodrow Wilson has lately given expression to the view that, as a nation, we are too prone to legislate for evils instead of educating for their elimination; the shortening of the hours of labor employed by the Government is one instance of this tendency. Why should a Government employee be better paid for lesser output than the employee of private activities? Why should Government demoralize private activities by premiumizing inefficiency? And last, why should a government set its people the example of setting the laws of sound economics at defiance? Admitting, for the sake of argument, what I do not believe, that we should strive to instal the universal eight-hour day, why do we legislate instead of educating for this ideal? Will education perhaps show the fallacy of the ideal?

HOW AN EMPLOYER SHOULD HANDLE HIS MEN.

Experience and observation have convinced me that it is possible to teach labor sound economics. But there are two conditions precedent. One is that labor must feel that the employer means fair; the other is that labor must know that the employer knows what he is talking about, that he knows a day's work when he sees it, that he knows his fellow man, &c. Experience and observation have also convinced me that it pays the employer, in concrete shape, to play fair with his men and to take the trouble to make plain to the men one's *leitmotif*.

I have seen a superintendent cut a piece work rate in half without eliciting a murmur of dissent from the employee affected. The superintendent was a man who had that innate broadness of heart which impels a man to act as wisely from feeling as does the man with the

broad mind who is impelled to act wisely from real intelligence. He was a thorough judge of men, and he would not know what the word "psychologist" meant at that. He had established a piece work schedule based upon a fair, not high, day rate per hour and a difference of about 1.3 (66 2-3 per cent.) between the day rate and the piece work rate; that is, a man could earn on piece work about one-third more than the day work rate per hour.

He had proved to the men that he was satisfied with getting his work done at this rate; that the more the men earned the better he was pleased. His men earned as high as 39.2 cents per hour on piece work; a man who could not or would not get on piece work labeled himself and punished his own pocket. In the case I saw he had caused to be made devices to increase the man's output. He approached the man with this statement: "Bill, I've spent some money on these jigs and I think they'll double your output; now, of course, the company expects me to get the cost of these jigs back. I want you to cut the rate in half, but, understand, you shall have as much money as you got last month at the old rate. But I expect you to play fair; give me all that there is in you; you know you need not fear a cut. I'm satisfied with getting my rate on this job cut in half; you are more than welcome to all you can earn."

I saw this employee a week or so after this, and he told me he was doing about 10 per cent. better per hour on the new rate than he had done without the jigs on the old rate. That is the kind of man to have at the head of a shop. He will get the confidence of his men and will hold it. He has educated his men and always explains to them just what he is getting at and "the why." He bases his piece work rate on the average man being only two-thirds of a first-class man—*i. e.*, the 66 2-3 per cent. efficiency proposition is the average man, and he can evolute up to the efficiency of a 100 per cent. man—if it is in him. The superintendent is there to help him, that the man knows; hence, he strives for a goal which he knows is potentially attainable.

The path of peace and of profit in matters industrial lies along lines which are truly educational and which are based upon the firm conviction that the "square deal" is the Indian sign of "real intelligence."

MAX H. C. BROMBACHER.

NEW YORK, December 12, 1910.

## Efficiency in American Shipyards

W. L. Capps, chief constructor of the United States Navy, chief of the Bureau of Construction and Repair, makes some interesting statements in his annual report to the Secretary of the Navy for the fiscal year 1910. He calls attention to the increasing rapidity of construction of naval vessels in the United States during the past few years. "This increase in rapidity," he says, "is due in part to greater familiarity with Government work on the part of contractors and in part to a more complete preparation of plans than was hitherto practicable; also to the efforts made to restrict changes in contract plans to the lowest number compatible with the interests of the Government. As a matter of fact, the rapidity of warship construction in the United States compares most favorably at the present time with the rate of such construction in those foreign countries which have established a reputation for rapidity in such work." He further states that the "decreased time of construction has been obtained concurrently with a decrease in the unit cost of construction; in fact, the total cost per ton of displacement of battleships built by contract for the United States Navy within the past few years has been less than the total cost per ton of displacement of similar vessels built in foreign countries, and this in spite of the higher rates of wages paid to workmen in United States shipyards."

The population of the city of Spokane, Wash., is 104,402, an increase of 67,554, or 183.3 per cent.

## The Proposed Increase in Railroad Efficiency

Commenting on the claims made at the recent rate hearing at Washington of possible savings that could be pointed out to railroad managers, the *Railway Age Gazette* says:

"We are not optimistic as to Mr. Brandeis' chances of success in his role of instructor in a course on practical railroading before a classroom full of railroad presidents. But we can hope for some indirect results of the publicity given to his claims. It will do good to air the whole subject of scientific management, betterment work, efficiency or whatever one calls it. Some operating officers and many boards of directors need to know what efficiency means. Ordering a subordinate to cut his expenses in two is not what it means. A superintendent of motive power has gone through a hard winter with his power in bad shape. He is told to get it in good shape for the next winter, perhaps with the intimation that his position depends on his success. He builds up a well organized, smooth working shop force, improves his repair shop facilities and gathers the right men at his coaling stations. Along in June an order comes down from above telling him to cut expenses in two. What can he do? His motive power starts the next winter in worse shape than ever. One cannot get a high unit of efficiency without holding trained employees during slack periods so as to be ready when the rush comes. It takes an expensive plant to do a wide variety of work cheaply."

## Iron Ore on Lake Erie Docks December 1

It has been the custom of Cleveland iron ore interests for many years to collect figures showing iron ore on railroad docks at Lake Erie ports at the close of navigation, December 1 being the usual date. Reports which have been made to *The Iron Age* from the various merchant docks, leaving out blast furnace docks on the lake front or on rivers at the various ports, show total stocks on December 1, 1910, of 9,414,670 gross tons. This compares with 8,965,789 tons December 1, 1909. The increase is 448,881 tons, whereas it had been estimated that about 1,000,000 tons more ore would be on dock this year than one year previous. The returns by ports are as follows:

*Iron Ore on Lake Erie Docks, December 1, 1910.—Gross Tons.*

| | | | |
|---|---|---|---|
| Ashtabula | 3,318,051 | Huron | 375,118 |
| Buffalo | 452,795 | Lorain | 259,448 |
| Cleveland | 1,599,046 | Toledo | 440,053 |
| Conneaut | 1,329,997 | Sandusky | 17,728 |
| Erie | 782,464 | | |
| Fairport | 839,970 | Total | 9,414,670 |

Stocks in furnace yards, which are doubtless more than double the stocks on docks, need to be known to make any correct analysis of the situation. It is safe to reckon, however, that Central Western furnaces have available in their yards and on docks enough ore, if it could be apportioned to all users—as it cannot be—to supply the needs of all far into the fall of 1911.

The Lewis Institute, Chicago, announces that the winter quarter will open in all departments January 3. An evening course in gas engines is announced. The present quarter shows the largest number in attendance in the history of the institute, 2700 being registered, counting both day and evening students. On December 16 the first class to complete the two-year co-operative course for machine shop apprentices will leave the institute. There are 20 of these boys, and they are making plans to enter the evening classes in January, in order to continue their studies. Candidates are now being registered for the entering class in the co-operative course. They will begin work January 3. These boys pass their time alternately between the institute and the machine shops, changing about every week.

# The Iron and Metal Markets

## A Comparison of Prices

**Advances Over the Previous Week in Heavy Type, Declines in Italics.**

At date, one week, one month and one year previous.

| | Dec. 14, 1910. | Dec. 7, 1910. | Nov. 16, 1910. | Dec. 15, 1909. |
|---|---|---|---|---|
| **PIG IRON,** Per Gross Ton: | | | | |
| Foundry No. 2, standard, Philadelphia | $15.50 | $15.50 | $15.75 | $19.00 |
| Foundry No. 2, Southern, Cincinnati | 14.25 | 14.25 | 14.25 | 17.25 |
| Foundry No. 2, local, Chicago | 16.00 | 16.00 | 16.00 | 19.00 |
| Basic, delivered, eastern Pa. | 14.75 | 14.75 | 14.75 | 18.75 |
| Basic, Valley furnace | 13.50 | 13.50 | 13.25 | 17.00 |
| Bessemer, Pittsburgh | 15.90 | 15.90 | 15.90 | 19.90 |
| Gray forge, Pittsburgh | 13.90 | 13.90 | 14.15 | 17.40 |
| Lake Superior charcoal, Chicago | 18.00 | 18.00 | 18.00 | 19.50 |
| **BILLETS, &c.,** Per Gross Ton: | | | | |
| Bessemer billets, Pittsburgh | 23.00 | 23.00 | 23.50 | 27.50 |
| Forging billets, Pittsburgh | .... | .... | 28.50 | 31.00 |
| Open hearth billets, Philadelphia | 25.50 | 25.50 | 25.50 | 30.60 |
| Wire rods, Pittsburgh | 28.00 | 28.00 | 28.00 | 33.00 |
| **OLD MATERIAL,** Per Gross Ton: | | | | |
| Iron rails, Chicago | *15.50* | 16.00 | 16.00 | 20.00 |
| Iron rails, Philadelphia | *17.00* | 18.00 | 18.00 | 20.50 |
| Car wheels, Chicago | 13.50 | 13.50 | 13.50 | 18.50 |
| Car wheels, Philadelphia | *13.25* | 13.75 | 13.75 | 17.50 |
| Heavy steel scrap, Pittsburgh | 13.75 | 13.75 | 14.25 | 18.25 |
| Heavy steel scrap, Chicago | *12.00* | 12.25 | 12.25 | 16.00 |
| Heavy steel scrap, Philadelphia | *12.50* | 12.75 | 13.50 | 18.00 |
| **FINISHED IRON AND STEEL,** Per Pound: | Cents. | Cents. | Cents. | Cents. |
| Bessemer steel rails, heavy, at mill | 1.25 | 1.25 | 1.25 | 1.25 |
| Refined iron bars, Philadelphia | 1.35 | 1.35 | 1.37 | 1.65 |
| Common iron bars, Chicago | 1.35 | 1.35 | 1.35 | 1.60 |
| Common iron bars, Pittsburgh | 1.40 | 1.40 | 1.45 | 1.70 |
| Steel bars, tidewater, New York | 1.56 | 1.56 | 1.56 | 1.66 |
| Steel bars, Pittsburgh | 1.40 | 1.40 | 1.40 | 1.50 |
| Tank plates, tidewater, New York | 1.56 | 1.56 | 1.56 | 1.71 |
| Tank plates, Pittsburgh | 1.40 | 1.40 | 1.40 | 1.55 |
| Beams, tidewater, New York | 1.56 | 1.56 | 1.56 | 1.71 |
| Beams, Pittsburgh | 1.40 | 1.40 | 1.40 | 1.55 |
| Angles, tidewater, New York | 1.56 | 1.56 | 1.56 | 1.71 |
| Angles, Pittsburgh | 1.40 | 1.40 | 1.40 | 1.55 |
| Skelp, grooved steel, Pittsburgh | 1.25 | 1.25 | 1.25 | 1.60 |
| Skelp, sheared steel, Pittsburgh | 1.30 | 1.30 | 1.35 | 1.65 |
| **SHEETS, NAILS AND WIRE,** Per Pound: | Cents. | Cents. | Cents. | Cents. |
| Sheets, black, No. 28, Pittsburgh | **2.20** | 2.15 | 2.20 | 2.40 |
| Wire nails, Pittsburgh* | 1.70 | 1.70 | 1.70 | 1.85 |
| Cut nails, Pittsburgh | 1.60 | 1.60 | 1.60 | 1.80 |
| Barb wire, galv., Pittsburgh* | 2.00 | 2.00 | 2.00 | 2.15 |
| **METALS,** Per Pound: | Cents. | Cents. | Cents. | Cents. |
| Lake copper, New York | 13.00 | 13.00 | 13.00 | 13.75 |
| Electrolytic copper, New York | *12.75* | 12.87½ | 12.87½ | 13.50 |
| Spelter, New York | *5.85* | 6.00 | 5.95 | 6.40 |
| Spelter, St. Louis | *5.75* | 5.85 | 5.80 | 6.25 |
| Lead, New York | 4.50 | 4.50 | 4.40 | 4.60 |
| Lead, St. Louis | *4.35* | 4.40 | 4.30 | 4.52½ |
| Tin, New York | **38.55** | 37.95 | 36.50 | 32.80 |
| Antimony, Hallett, New York | 7.75 | 7.75 | 7.75 | 8.25 |
| Tin plate, 100 lb., box, New York | $3.84 | $3.84 | $3.84 | $3.74 |

* These prices are for largest lots to jobbers.

## Prices of Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c. Rates to the Pacific Coast are 80c. on plates, structural shapes and sheets, No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought boiler tubes.

**Structural Material.**—I-beams and channels, 3 to 15 in., inclusive, 1.40c. to 1.45c., net; I-beams over 15 in., 1.50c. to 1.55c., net; H-beams over 8 in., 1.55c. to 1.60c.; angles, 3 to 6 in., inclusive, ¼ in. and up, 1.40c. to 1.45c., net; angles over 6 in., 1.50c. to 1.55c., net; angles, 3 in., on one or both legs, less than ¼ in. thick, 1.45c., plus full extras as per steel bar card, effective September 1, 1909; tees, 3 in. and up, 1.40c. to 1.45c., net.; tees, 3 in. and up, 1.40c. to 1.45c., net; angles, channels and tees, under 3 in., 1.45c., base, plus full extras as per steel bar card of September 1, 1909; deck beams and bulb angles, 1.70c. to 1.75c., net, hand rail tees, 2.50c.; checkered and corrugated plates, 2.50c., net.

**Plates.**—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.40c. to 1.45c., base. Following are stipulations prescribed by manufacturers, with extras to be added to base price (per pound) of plates:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼-in. thick and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼-in. thick on edge, or not less than 11 lb. per square foot, to take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16-in. take the price of 3-16-in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

| | |
|---|---|
| Gauges under ¼-in. to and including 3-16-in. on thinnest edge | $0.10 |
| Gauges under 3-16-in. to and including No. 8 | .15 |
| Gauges under No. 8 to and including No. 9 | .25 |
| Gauges under No. 9 to and including No. 10 | .30 |
| Gauges under No. 10 to and including No. 12 | .40 |
| Sketches (including all straight taper plates), 3 ft. and over in length | .10 |
| Complete circles, 3 ft. in diameter and over | .20 |
| Boiler and flange steel | .10 |
| "A. B. M. A." and ordinary firebox steel | .20 |
| Still bottom steel | .30 |
| Marine steel | .40 |
| Locomotive firebox steel | .50 |
| Widths over 100 in. up to 110 in., inclusive | .05 |
| Widths over 110 in. up to 115 in., inclusive | .10 |
| Widths over 115 in. up to 120 in., inclusive | .15 |
| Widths over 120 in. up to 125 in., inclusive | .25 |
| Widths over 125 in. up to 130 in., inclusive | .50 |
| Widths over 130 in | 1.00 |
| Cutting to lengths or diameters under 3 ft. to 2 ft., inclusive | .25 |
| Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive | .50 |
| Cutting to lengths or diameters under 1 ft. | 1.55 |

No charge for cutting rectangular plates to lengths 3 ft. and over.

TERMS.—Net cash 30 days.

**Sheets.**—Makers' prices for mill shipments on sheets in carload and larger lots, on which jobbers charge the usual discounts for small lots from store, are as follows: Blue annealed sheets, Nos. 3 to 8, U. S. standard gauge, 1.60c.; Nos. 9 and 10, 1.65c.; Nos. 11 and 12, 1.70c.; Nos. 13 and 14, 1.75c.; Nos. 15 and 16, 1.85c. One pass, cold rolled, box annealed sheets, Nos. 10 and 11, 1.85c.; Nos. 12 to 14, 1.90c.; Nos. 15, 16 and 17, 1.95c.; Nos. 18 to 21, 2c.; Nos. 22, 23 and 24, 2.05c.; Nos. 25 and 26, 2.10c.; Nos. 27 and 28, 2.20c.; No. 29, 2.25c.; No. 30, 2.35c. Three pass cold rolled sheets, box annealed, are as follows: Nos. 15 and 16, 2.05c.; Nos. 17 to 21, 2.10c.; Nos. 22 to 24, 2.15c.; Nos. 25 and 26, 2.20c.; No. 27, 2.25c.; No. 28, 2.30c. Galvanized sheets, Nos. 10 and 11, black sheet gauge, 2.20c.; Nos. 12, 13 and 14, 2.30c.; Nos. 15, 16 and 17, 2.45c.; Nos. 18, 19, 20 and 21, 2.60c.; No. 22, 2.65c.; Nos. 23 and 24, 2.70c.; Nos. 25 and 26, 2.90c.; No. 27, 3.05c.; No. 28, 3.20c.; No. 29, 3.30c.; No. 30, 3.50c. Painted roofing sheets, No. 28, $1.55 per square. Galvanized sheets, No. 28, $2.75 per square for 2½-in. corrugations. All above prices are f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount 10 days from date of invoice.

**Wrought Pipe.**—The following are the jobbers' carload discounts on the Pittsburgh basing card on wrought pipe, in effect from October 1:

| | Steel. Black. | Steel. Galv. | Iron. Black. | Iron. Galv. |
|---|---|---|---|---|
| **Butt Weld.** | | | | |
| ⅛, ¼, ⅜ in. | 72 | 58 | 68 | 54 |
| ½ in. | 75 | 63 | 71 | 59 |
| ¾ to 1¼ in. | 79 | 69 | 75 | 65 |
| 2 to 3 in. | 80 | 70 | 76 | 66 |
| **Lap Weld.** | | | | |
| 2 in. | 76 | 66 | 72 | 62 |
| 2½ to 4 in. | 78 | 68 | 74 | 64 |
| 4½ to 6 in. | 77 | 67 | 73 | 63 |
| 7 to 12 in. | 75 | 59 | 71 | 55 |
| 13 to 15 in. | 51½ | .. | .. | .. |
| **Butt Weld, extra strong, plain ends, card weights.** | | | | |
| ⅛, ¼, ⅜ in. | 69 | 59 | 65 | 55 |
| ½ in. | 74 | 68 | 70 | 64 |
| ¾ to 1¼ in. | 78 | 72 | 74 | 68 |
| 2 to 3 in. | 79 | 73 | 75 | 69 |
| **Lap Weld, extra strong, plain ends, card weight.** | | | | |
| 2 in. | 75 | 69 | 71 | 65 |
| 2½ to 4 in. | 77 | 71 | 73 | 67 |
| 4½ to 6 in. | 76 | 70 | 72 | 66 |
| 7 to 8 in. | 69 | 59 | 65 | 55 |
| 9 to 12 in. | 64 | 54 | 60 | 50 |
| **Butt Weld, double extra strong, plain ends, card weight.** | | | | |
| ½ in. | 64 | 58 | 60 | 54 |
| ¾ to 1¼ in. | 67 | 61 | 63 | 57 |
| 2 to 3 in. | 69 | 63 | 65 | 59 |
| **Lap Weld, double extra strong, plain ends, card weight.** | | | | |
| 2 in. | 65 | 59 | 61 | 55 |
| 2½ to 4 in. | 67 | 61 | 63 | 57 |
| 4½ to 6 in. | 66 | 60 | 62 | 56 |
| 7 to 8 in. | 59 | 49 | 55 | 45 |

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| | Plugged and Reamed. |
|---|---|
| 1 to 1½, 2 to 3 in...Butt Weld | Will be sold at two (2) points lower basing (higher price) than merchant or card weight pipe. Butt or Lap Weld as specified. |
| 2, 2½ to 4 in.....Lap Weld | |

The above discounts are for "card weight," subject to the usual variation of 5 per cent. Prices for less than carloads are three (3) points lower basing (higher price) than the above discounts.

**Boiler Tubes.**—Discounts on lap welded steel and charcoal iron boiler tubes to jobbers in carloads are as follows:

| | Steel. | Iron. |
|---|---|---|
| 1 to 1¼ in | 49 | 43 |
| 1¾ to 2¼ in | 61 | 43 |
| 2½ in | 63 | 48 |
| 2¾ to 5 in | 69 | 55 |
| 6 to 13 in | 61 | 43 |

2½ in. and smaller, over 18 ft., 10 per cent. net extra.
2¾ in. and larger, over 22 ft., 10 per cent. net extra.
Less than carloads to destinations east of the Mississippi River will be sold at delivered discounts for carloads lowered by two points, for lengths 22 ft. and under; longer lengths, f.o.b. Pittsburgh.

**Wire Rods.**—Bessemer rods, $28; open hearth and chain rods, $28.50.

**Steel Rivets.**—Structural rivets, ¾ in. and larger, 1.90c., base; cone head boiler rivets, ¾ in. and larger, 2c., base; ⅝ in. and 11-16 in. take an advance of 15c., and ½ in. and 9-16 in. take an advance of 50c.; in lengths shorter than 1 in. also take an advance of 50c. Terms are 30 days, net cash, f.o.b. mill.

## Pittsburgh

PARK BUILDING, December 14, 1910.—(*By Telegraph.*)

**Pig Iron.**—The market is neglected, there being no new inquiries of moment. Stocks of pig iron are still increasing, and no permanent improvement in the market can be expected until the output is materially diminished. Prices are largely nominal. We quote standard Bessemer iron, $15; basic, $13.50; malleable Bessemer, $13.75; No. 2 foundry, $13.75, and gray forge, $13, all at Valley furnace, the freight rate to the Pittsburgh district being 90c. a ton.

**Steel.**—There is very little new inquiry, and only occasional sales of small lots of billets, sheet and tin bars are being made. Small lots of open hearth sheet bars are still being offered by outside mills below $24, Pittsburgh. We quote Bessemer and open hearth billets, 4 x 4 in. and up to but not including 10 x 10 in., at $23, base, and sheet and tin bars in 30-ft. lengths, $24, f.o.b. Pittsburgh, full freight to destination added.

(*By Mail.*)

Reports this week are somewhat conflicting, two of the larger steel interests stating that both specifications and orders in the past week have shown improvement, while others say that conditions are quieter than they have been at any time during this year. The trade is still apprehensive that a revision in prices on finished iron and steel, to be followed by lower values on pig iron, billets and bars, may come shortly after the first of the year, and for this reason distributers and consumers are placing orders with a good deal of caution and only to cover actual needs. The sheet market is reported to be on a better basis as a result of the meeting held here last week.

**Ferromanganese.**—The demand is light. A local consumer has bought a carload for prompt shipment at $38.50, Baltimore. We quote 80 per cent. foreign, for delivery through the first half, at $38.25 to $38.50, Baltimore, the rate to Pittsburgh being $1.95 a ton.

**Ferrosilicon.**—There is practically no new inquiry. We quote 50 per cent. for delivery over first half at $54 to $55, and for prompt delivery at $55 to $55.50. We quote 10 per cent. blast furnace silicon at $23; 11 per cent., $24; 12 per cent., $25, f.o.b. cars Jisco and Ashland furnaces.

**Skelp.**—A sale of 500 tons of grooved steel skelp at about 1.25c., delivered at buyer's mill, Pittsburgh district, is reported. We quote grooved steel skelp, 1.25c. to 1.30c.; sheared steel skelp, 1.30c. to 1.35c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.70c. to 1.75c., all for delivery at consumers' mills in the Pittsburgh district, usual terms.

**Rods.**—Some small inquiry is being received for both Bessemer and open hearth rods, and a sale of 200 tons of Bessemer rods for January delivery is reported at $28, Pittsburgh. Specifications against contracts, especially from the chain manufacturers, are not coming in at a satisfactory rate, and in some cases have been held up entirely. We quote Bessemer rods at $28 and open hearth about $28.50, f.o.b. Pittsburgh, but it is stated that on Bessemer rods the price has recently been shaded.

**Muck Bar.**—The market is very dull and prices are weak. We quote best grades of muck bar, made from all pig iron, at about $29, Pittsburgh.

**Steel Rails.**—The demand for light rails is not quite so active. The Carnegie Steel Company received new orders and specifications in the past week for about 2000 tons. Quotations on light rails are as follows: 12-lb. rails, 1.25c.; 16, 20 and 25 lb., 1.21c. to 1.25c.; 30 and 35 lb., 1.20c., and 40 and 45 lb., 1.16c. The prices are f.o.b. at mill, plus freight, and are the minimum of the market on carload lots, small lots being sold at a little higher price. We quote standard sections at 1.25c. per pound.

**Plates.**—Three or four projects that will take large tonnages are being figured on by the plate mills, but are not in position to be given out. No new contracts have been placed for cars in the past week, but it is understood that the courts have granted permission to the Wabash-Pittsburgh Terminal to place orders for 2000 steel coal cars, and this inquiry is likely to come out in a few days. The Pittsburgh, Shawmut & Northern Railroad is figuring on the purchase of some cars, but nothing has been done. The general demand from boiler shops and other consumers is reported as slightly better. We continue to quote ¼-in. and heavier plates in the wider sizes at 1.40c., Pittsburgh, while on the narrow sizes 1.35c., Pittsburgh, is still being named. There are reports of lower prices than 1.40c. on wide plates being named by one or two mills, but these are not confirmed.

**Structural Material.**—Local structural interests report that little new business has been placed. Work coming up in this vicinity includes about 500 tons for the extension to the Hotel Schenley, and about 1000 tons for the new additions to the Carnegie Technical Schools. The Fort Pitt Bridge Works is completing shipments on the structural steel for the new open hearth plant of the Jones & Laughlin Steel Company at Aliquippa, Pa., for which it has furnished upward of 10,000 tons. We continue to quote beams and channels up to 15 in. on the basis of 1.40c., Pittsburgh, but there are still persistent reports that this price is shaded by some mills as a basing price for delivery at certain points.

**Sheets.**—A well attended meeting of the independent sheet mills was held in the Fort Pitt Hotel in this city last Thursday, at which J. A. Campbell, president of the Youngstown Sheet & Tube Company, presided. The unsatisfactory conditions existing in the trade were thoroughly discussed, and it was the opinion that to make any official reduction in prices of sheets would not help the market but make it worse. It was decided to make a strong effort to maintain prices on the basis of 2.20c. for one pass No. 28 black, and 3.20c. for No. 28 galvanized. We are advised that all the mills are now quoting on this basis, with the usual differentials for the lighter and heavier gauges. The full schedule of prices on black and galvanized and on roofing sheets as affirmed at the meeting is printed on a previous page.

**Tin Plate.**—The new demand is dull, and the mills are operating mostly on contracts from the meat packers and can makers, on which deliveries will probably not start for several months. The American Sheet & Tin Plate Company is operating to slightly less than 60 per cent. of capacity, and some of the independent mills are running at about the same rate. Reports that prices of tin plate have been shaded recently are officially denied, and the market is reported firm on the basis of $3.60 per base box for 100-lb. cokes, f.o.b. Pittsburgh.

**Bars.**—Specifications for both iron and steel bars show a falling off, as compared with November, but this is due to the fact that inventory period is close at hand and consumers are taking in as little as possible. Shortly after January 1 conditions are expected to be materially better. We continue to quote soft steel bars and common iron bars at 1.40c., Pittsburgh, but at certain points of delivery this price is sometimes shaded a basing price.

**Hoops and Bands.**—The demand continues light and specifications against contracts have fallen off. We quote hoops at 1.50c. in large lots and 1.55c. in small lots; bands, 1.40c. in carload and larger lots and 1.45c. in small lots, the latter carrying extras as given in the steel bar card dated September 1, 1909.

**Cotton Ties.**—The season is pretty well over, and on the small belated shipments against contracts that are being made this month, 78c. per bundle is being charged.

**Spikes.**—Orders received are only for small lots. Expected inquiries from several Eastern roads have failed to develop. There are reports that prices are being shaded to some extent. We quote standard sizes of railroad spikes at 1.50c. to 1.55c. for Western shipment and 1.55c. to 1.60c., for local trade. We quote small railroad and boat spikes at 1.60c. to 1.65c., base, in carload and larger lots.

**Spelter.**—The market continues dull, and prices have shown a further decline. We quote prime grades of West-

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ern spelter at 5.70c., East St. Louis, equal to 5.82½c., Pittsburgh.

**Merchant Steel.**—Specifications from agricultural implement makers are coming in at a fairly satisfactory rate, but from other consumers are light, especially from the automobile industry. We quote, f.o.b. Pittsburgh: Iron finished tire, 1½ x ½ in. and heavier, 1.40c., base; under these sizes, 1.55c.; planished tire, 1.60c.; channel tire, 1.80c., base; toe calk, 1.95c.; flat sleigh shoe, 1.55c.; concave or convex, 1.75c.; cutter shoes, tapered or bent, 2.25c.; spring steel, 2c.; machinery steel, smooth finish, 1.90c.

**Shafting.**—The demand is only for small lots to cover actual needs, while specifications against contracts from the agricultural implement makers and automobile builders have shown a heavy falling off. Regular discounts are being fairly well maintained, and are 55 per cent. off in carload and larger lots, and 50 per cent. off in small lots, delivered in base territory. On desirable contracts and for large lots 55 and 5 per cent. is being named.

**Wire Products.**—Orders for wire nails and wire continue to be confined to small lots, while specifications against contracts are coming in at only a fairly satisfactory rate. A material betterment in the demand is looked for after the first of the year. Prices are fairly strong, it being stated that the slight cutting in wire nails has almost entirely disappeared. We quote galvanized barb wire at $2; painted, $1.70; annealed fence wire, $1.50; galvanized, $1.80; wire nails, $1.70, and cut nails, $1.60, in carload and larger lots, all f.o.b. Pittsburgh, freight to destination being added.

**Merchant Pipe.**—A local mill took a contract last week for 6 miles of 4-in. and 15 miles of 3 and 6 in. pipe. General trade is dull, and all the mills could handle a good deal more business if they had it. Some large gas and oil lines are still under way, but are progressing slowly, and may not be given out before spring. It is stated that discounts on both iron and steel pipe, printed on a previous page, are not being absolutely maintained.

**Boiler Tubes.**—The new demand is quiet, both for locomotive and merchant tubes, and discounts are still being very materially shaded.

**Coke.**—Several inquiries for furnace coke are in the market, and are expected to be closed before the month is out. The new demand for foundry coke is quiet, most customers being covered through the first quarter and first half. Slow progress is being made on the plan now under way by some of the leading independent coke furnaces to put the market on a better basis, and it now seems doubtful whether anything definite will be accomplished. The output in the Upper and Lower Connellsville regions last week was 289,668 tons, an increase of about 600 tons over the previous week. We quote standard makes of furnace coke for prompt shipment at $1.45 to $1.50 per net ton, at oven, while for delivery over first half $1.75 to $1.80 is quoted. Best make of 72-hour foundry coke for prompt shipment are held at about $2 per net ton, at oven, and for first half from $2.10 up to $2.50.

**Iron and Steel Scrap.**—Little is being sold, as inventory period is close at hand. The scrap list of the Baltimore & Ohio Railroad closed December 6, the Pennsylvania Railroad scrap list December 7 and its rail list December 8, and the prices obtained were lower than for some months. There has been a material decline in prices of old rails, while heavy steel scrap is weak and borings and turnings are lower. A sale of 1500 tons of heavy steel scrap has been made at $14, delivered, which is top of the market; also 500 tons of rerolling rails at $15.75, delivered, and 500 tons at $15.25, delivered, but these prices are higher than the market to-day; also a sale of 500 tons of bundled sheet scrap at $10.25, delivered, making it about $9.25 at shipping point. Dealers quote about as follows, per gross ton, f.o.b. Pittsburgh or elsewhere, as noted:

| | |
|---|---|
| Heavy steel scrap, Steubenville, Follansbee, Sharon, Monessen and Pittsburgh delivery | $13.75 to $14.00 |
| No. 1 foundry cast | 13.50 to 13.75 |
| No. 2 foundry cast | 12.75 to 13.00 |
| Bundled sheet scrap, at point of shipment | 9.00 |
| Rerolling rails, Newark and Cambridge, Ohio, and Cumberland, Md. | 15.00 to 15.25 |
| No. 1 railroad malleable stock | 13.00 to 13.25 |
| Grate bars | 11.25 to 11.50 |
| Low phosphorus melting stock | 17.50 to 17.75 |
| Iron car axles | 24.00 to 24.50 |
| Steel car axles | 20.25 to 20.50 |
| Locomotive axles | 24.50 to 25.00 |
| No. 1 busheling scrap | 12.25 to 12.50 |
| No. 2 busheling scrap | 8.75 to 9.00 |
| Old car wheels | 13.50 to 13.75 |
| Sheet bar crop ends | 15.75 to 16.00 |
| Cast iron borings | 7.90 to 8.00 |
| Machine shop turnings | 8.60 to 8.75 |
| Old iron rails | 16.00 to 16.25 |
| No. 1 wrought scrap | 14.50 to 14.75 |
| Stove plate | 14.50 to 14.75 |
| Heavy steel axle turnings | 10.25 to 10.50 |

## Chicago

FISHER BUILDING, December 14, 1910.—(*By Telegraph.*)

Prices of finished materials are firmer this week. This is especially true of sheets, on which concessions had been quite general a week ago. Structural shapes and plates are holding firmly and there is less suspicion regarding the maintenance of the 1.40c., Pittsburgh, price on steel bars. The volume of new business is very light, and in plates and structural material the mills are nearing the end of their specifications without having taken new business to keep going. In other products the mills which hold yearly contracts for large tonnages are doing better. The leading local soft steel bar mill which sells to the general trade will shut down the end of this week, and the hard steel bar mills are running at about half their capacity. There is less new buying of sheets, and the Inland Steel Company expects to close down some of its mills before the end of the year. At Gary a blast furnace went out December 12, leaving three of the eight furnaces in blast. The wire mills are making a better showing, as their business is on a normal basis. Jobbers are buying freely for January and February shipment, and expect a good movement of wire products for spring trade. Railroad contracts for fence are also for normal requirements. Railroad purchases of bar iron are increasing steadily, taking the form of orders for 500-ton lots for short delivery periods. No new orders or inquiries for freight cars are reported from Western roads, and the Great Northern inquiry for 1000 steel cars has not been closed. The car builders have contracts for steel passenger cars which will fill their capacity for six months in this line, but many of the leading Western roads have not bought any freight cars for more than a year. Some of the equipment industries expect to be running full by February 1. Railroad traffic is falling off and there is less complaint of car shortage. The slowing down of industries for the inventory season will enable the railroads to keep up with traffic until January, but the condition of their equipment is growing steadily worse and will make operating expenses high and earnings less during the winter. The scrap market has reached the lowest level of prices for the year, and the decline in the last two weeks is not a favorable indication for the immediate future of scrap using industries.

**Pig Iron.**—The market has settled down to another waiting period. A majority of the foundries in this territory have sufficient stocks on hand or iron purchased to carry them through the first quarter at the present rate of consumption, and those which are not covered are only picking up small lots from time to time. Many of the implement manufacturers have covered for the full first half, but as a rule the furnace interests have not sold much for deliveries extending into the second quarter. Alabama furnace interests continue in some cases to decline firm offers for first half at $11, Birmingham, but cannot obtain any better price now for the first quarter. The Northern furnace interests are doing what might be called a retail business, selling small lots up to 500 tons for prompt shipment or for short delivery periods. The current demand for all grades is checked by the inventory season, which is now at hand, and the furnace interests do not expect any general buying movement until the equipment industries and malleable foundries get back to a normal basis on railroad business. In many important lines the foundries are running at normal capacity. This is true of all the agricultural implement manufacturers, and the stove foundries have also had a good year. The chief depressing influence is the decreased melt in the malleable foundries which use a large portion of the Northern iron made in this district. The following quotations are for December shipment, Chicago delivery:

| | |
|---|---|
| Lake Superior charcoal | $18.00 to $18.50 |
| Northern coke foundry, No. 1 | 16.50 to 17.00 |
| Northern coke foundry, No. 2 | 16.00 to 16.50 |
| Northern coke foundry, No. 3 | 15.75 to 16.00 |
| Northern Scotch, No. 1 | 17.00 to 17.50 |
| Southern coke, No. 1 | 15.85 to 16.35 |
| Southern coke, No. 2 | 15.35 to 15.85 |
| Southern coke, No. 3 | 15.10 to 15.60 |
| Southern coke, No. 4 | 14.85 to 15.35 |
| Southern coke, No. 1 soft | 15.85 to 16.35 |
| Southern coke, No 2 soft | 15.35 to 15.85 |
| Southern gray forge | 14.60 to 15.10 |
| Southern mottled | 14.60 to 15.10 |
| Malleable Bessemer | 16.00 to 16.50 |
| Standard Bessemer | 17.40 to 17.90 |
| Jackson Co. and Kentucky silvery, 6% | 18.40 to 18.90 |
| Jackson Co. and Kentucky silvery, 8% | 19.40 to 19.90 |
| Jackson Co. and Kentucky silvery, 10% | 20.40 to 20.90 |

(*By Mail.*)

**Billets.**—The market is dull, with only an occasional inquiry, and the price of forging billets is nominal at $28, base, Chicago.

**Rails and Track Supplies.**—Only a few small orders were closed in Chicago last week. The Harriman lines are reported to be negotiating for their requirements for next

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year. Other large Western systems have all prepared estimates of their requirements, but are holding back their orders awaiting advices from Washington regarding the advance in rates and other political matters. The market for track supplies is very dull. We quote standard railroad spikes at 1.65c. to 1.75c., base; track bolts with square nuts, 2.20c. to 2.30c., base, all in carload lots, Chicago. Light rails, 40 to 45 lb., 1.16c. to 1.20½c.; 30 to 35 lb., 1.19½c. to 1.24c.; 16, 20 and 25 lb., 1.20½c. to 1.25c.; 12-lb., 1.25c. to 1.29½c., Chicago.

**Structural Material.**—While the general contract for the Insurance Exchange Building in Chicago has been let to the Thompson-Starrett Company, the steel work will not be let for two or three weeks, until certain details of the new building code are finally settled. The general contract for the McNeil office building has been let to the George A. Fuller Company, but the steel specifications have not been completed. There is a possibility that the Council may make changes in the building code on questions involving the permissible hight of buildings. The Insurance Exchange Building will require about 12,000 tons and the McNeil Building, 900 tons. George W. Jackson, Inc., has taken a contract amounting to about 450 tons for changes in the elevated loop in Chicago, principally in moving columns at corners to permit changing the routes of street car lines. Besides the new building projects which are pending in Chicago, a large tonnage is involved in new bridges, including both municipal and railroad bridges, which are on the slate to be erected the coming year. Prices are firmer on plain material. We quote plain material from mill, 1.58c. to 1.63c., Chicago; from store, 1.80c. to 1.90c., Chicago.

**Plates.**—The market is very dull, but prices are firmer, and the few orders that are going are distributed among the different mills selling in this market. Some of the railroads have asked for prices on contracts for a full year for boiler and tank plates for repair work, but the tonnage inquired for is disappointing. Steel passenger car orders have brought the mills quite a number of small orders for plates in the last two or three months, but no developments are reported in large orders for freight cars. We quote mill prices at 1.58c. to 1.63c., Chicago; store prices, 1.80c. to 1.90c., Chicago.

**Sheets.**—Prices have stiffened in the past week and are now held firmly by the mills on both black and galvanized sheets. The volume of business is disappointing, however, and the Inland Steel Company expects to shut down some of its mills before the end of the year. Prices from store, Chicago, are: No. 10, 2.10c. to 2.20c.; No. 12, 2.15c. to 2.25c.; No. 28 black, 2.75c. to 2.85c.; No. 28 galvanized, 3.65c. to 3.75c.

**Bars.**—The only encouraging feature is that the railroads are quietly increasing their specifications for bar iron. Orders for 500-ton lots are becoming common and are frequently renewed as they are soon covered by specifications. The railroads are using twice as much iron as they did a couple of months ago, and fair specifications are also coming in from the wagon trade. In soft steel bars there is very little new business. The rerolling mills are not running more than half capacity. The price is firm on soft steel bars, but the break in the price of old rails has lowered the quotation for hard steel bars. Bar iron is quoted nominally at 1.35c., but round lots for prompt shipment have sold as low as 1.30c. We quote as follows: Soft steel bars, 1.58c.; bar iron, 1.35c. to 1.40c.; hard steel bars rolled from old rails, 1.40c. to 1.45c., all Chicago. From store, soft steel bars, 1.80c. to 1.90c.

**Rods and Wire.**—Jobbers are furnishing good specifications for nails and barb wire for January and February shipment and advise the mills that they expect a good spring trade. Buyers of wire for manufacturing are also specifying at a satisfactory rate. The railroads are not curtailing their purchase of fence, and the Southern roads are placing contracts for their requirements for the full year 1911, these contracts calling for a normal tonnage. Jobbers' carload prices, which are quoted to manufacturing buyers, are as follows: Plain wire, No. 9 and coarser, base, 1.68c.; wire nails, 1.88c.; painted barb wire, 1.88c.; galvanized, 2.18c., all Chicago.

**Merchant Steel.**—The agricultural implement people have shown no hesitation this fall in their specifications for special grades of steel used in their product, this indicating that the check some time ago in specifying for bars was due entirely to fears of a decline in price. In merchant steel lines the mills are well supplied with business and are not affected by the dullness in heavy rolled products.

**Cast Iron Pipe.**—The only water pipe letting among Northern cities that is reported pending this week is one for 3500 tons at Cleveland, Ohio. The gas companies are beginning to negotiate for their requirements for next year and it is expected that contracts will be let during the next two months by most of the Northern gas companies. It is estimated that this business in Northern and Western territory amounts to about 100,000 tons a year. The gas companies are apparently satisfied that prices are as low as they can except. On current business we quote, per net ton, Chicago, as follows: Water pipe, 4-in., $27; 6 to 12 in., $26; 16-in. and up, $25, with $1 extra for gas pipe.

**Old Material.**—Dealers are generally taking losses on the material which they bought from the railroads in October and November. The slowing down among mills and foundries and unwillingness among buyers to increase their stocks before taking inventory has made the lowest prices of the year in some lines of scrap. The prices quoted below are for delivery to buyers' works, all freight and switching charges paid. Sellers of scrap usually receive 50c. to $1 less in this district, owing to high switching charges. Following prices are per gross ton, delivered, Chicago:

| | |
|---|---|
| Old iron rails | $15.50 to $16.00 |
| Old steel rails, rerolling | 14.00 to 14.50 |
| Old steel rails, less than 3 ft | 13.00 to 13.50 |
| Relaying rails, standard sections, subject to inspection | 23.00 to 24.00 |
| Old car wheels | 13.50 to 14.00 |
| Heavy melting steel scrap | 12.00 to 12.50 |
| Frogs, switches and guards, cut apart | 12.00 to 12.50 |
| Shoveling steel | 11.50 to 12.00 |

The following quotations are per net ton:

| | |
|---|---|
| Iron angles and splice bars | $13.50 to $14.00 |
| Iron car axles | 18.50 to 19.00 |
| Steel car axles | 18.50 to 19.00 |
| No. 1 railroad wrought | 11.50 to 12.00 |
| No. 2 railroad wrought | 10.50 to 11.00 |
| Springs, knuckles and couplers | 11.50 to 12.00 |
| Locomotive tires, smooth | 17.00 to 17.50 |
| No. 1 dealers' forge | 10.00 to 10.50 |
| Steel axle turnings | 7.75 to 8.25 |
| Machine shop turnings | 6.50 to 7.00 |
| Cast and mixed borings | 5.00 to 5.50 |
| No. 1 busheling | 9.50 to 10.00 |
| No. 1 boilers, cut to sheets and rings | 8.50 to 9.00 |
| Boiler punchings | 13.00 to 13.50 |
| No. 1 cast scrap | 12.25 to 12.75 |
| Stove plate and light cast scrap | 10.50 to 11.00 |
| Railroad malleable | 11.25 to 11.75 |
| Agricultural malleable | 10.50 to 11.00 |
| Pipes and flues | 8.75 to 9.25 |

## Philadelphia

PHILADELPHIA, PA., December 13, 1910.

The movement in pig iron has been light. In some classes of finished materials specifications have been coming out a trifle more freely, but the current demand shows no marked improvement. An increased volume of business in certain grades of old material is reported, but sales are largely of the bargain lot class, and lower prices have in some instances been established.

**Iron Ore.**—Arrivals of foreign ore at this port during the week ending December 10 aggregated 11,400 tons, valued at $22,600. From now on not much ore will be brought down from Canada, owing to the closing of navigation. Little interest is being taken in the market, the trade awaiting developments.

**Pig Iron.**—The bulk of the small business going has been confined to foundry irons. The principal sales have been to the cast iron pipe foundries, one Delaware River interest taking 5000 tons of Northern low grade iron at $14.25, delivered, shipment covering December and the first quarter of next year. Several small lot sales of pipe iron have also been reported. In the higher grades, sales range from carloads for spot shipment to several hundred tons for delivery over three or four months. Standard brands of eastern Pennsylvania No. 2 X foundry, for such delivery, are moving at $15.50 to $15.75, delivered. Some producers are holding at 25 cents higher, but are above the market and make few sales. In a few instances, less desirable brands are to be had at figures a shade under those quoted above, but are not considered as having any bearing on the market. A somewhat better movement is to be noted in Virginia foundry irons, several 500-ton sales of No. 2 X, together with a larger number of smaller sales, both for prompt, first quarter and first half delivery have been made, for which prices for both No. 2 X and No. 2 plain are comparatively firm at $13, furnace, equal to $15.80 to $16, delivered in buyers' yards in this vicinity. The Virginia Pig Iron Association, which met in this city last week, reported an increase in unfilled orders on Virginia makers' books, while stocks showed a negligible increase. No further reduction in output beyond that recently announced was reported. Very little interest is shown in forge iron, owing principally to the inactivity of the rolling mills. One of the smaller consumers of basic iron would probably place orders for a few thousand tons at a favorable price. Low phosphorus iron has been sold in small lots at unchanged prices, $22.50, delivered here, for standard analysis iron. While nothing has been heard regarding further curtailment of production, there will, no doubt, be another movement in that direction after the turn

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of the year, when deliveries on higher priced contracts, still unfilled, will have been completed. Consumers seem disinclined to buy beyond their near future needs, and sellers are not forcing business at the present range of prices, which for standard brands, delivered in buyers' yards, eastern Pennsylvania and nearby points, range about as follows:

| | |
|---|---|
| Eastern Pennsylvania, No. 2 X foundry | $15.50 to $15.75 |
| Eastern Pennsylvania, No. 2 plain | 15.00 to 15.25 |
| Virginia, No. 2 X foundry | 15.80 to 16.00 |
| Virginia, No. 2 plain | 15.80 to 16.00 |
| Gray forge | 14.25 to 14.50 |
| Basic | 14.75 to 15.00 |
| Standard low phosphorus | 22.50 |

**Ferromanganese.**—The market is bare of any important demand, and prices show continued weakness. While $38.50, Baltimore, for 80 per cent, is nominally quoted, it is not understood to be a firm price for first half delivery.

**Billets.**—There has been some inquiry for both rolling and forging billets for early 1911 delivery, but buyers are in no haste to place orders and continue to make their purchases on a hand to mouth basis. Mills are operating at about half capacity. Ordinary rolling billets, for either prompt or first quarter shipment, are quoted at $25.50 to $26, delivered. Forging billets are firm at $28, Eastern mill, the usual extras for high carbons and special sizes being added.

**Plates.**—A better volume of specifications has been coming to the mills from locomotive, boiler and bridge builders, but there is little improvement in the general run of new business. Mills are figuring on a fair tonnage of ship plates, both with one of the local yards as well as the Government, and a better volume of business is expected. Leading producers are firmly maintaining prices. For ordinary plates, 1.55c. to 1.60c., delivered in this territory, is named.

**Structural Material.**—A smaller volume of miscellaneous business is reported, due to unfavorable weather for outdoor work. Little has developed in the way of larger contracts. The Packard Motor Company has, it is stated, let the general contract for its new building, requiring about 900 tons, but the steel work has not yet been placed. Several other moderate building propositions are pending. Some mills are less actively engaged, as they have been rapidly catching up on old orders. Prices are unchanged, 1.55c. to 1.60c. being named for plain shapes, delivered in this vicinity.

**Sheets.**—The volume of new business offered is gradually falling off. Mills have little ahead and are largely dependent on day to day orders to maintain even the present productive rate. Prices are well maintained, the following range being quoted by Eastern mills for reasonably early shipment: Nos. 18 to 20, 2.50c.; Nos. 22 to 24, 2.60c.; Nos. 25 and 26, 2.70c.; No. 27, 2.80c.; No. 28, 2.90c.

**Bars.**—The demand has been almost of a retail character, business offered hardly being sufficient to induce competition. Under the circumstances it is difficult to say what prices could be had were a desirable order to come before the trade. For moderate lots 1.35c. to 1.45c. is quoted for refined iron bars, delivered in this vicinity. Steel bars have not been particularly active, and quotations are unchanged at 1.55c. to 1.60c.

**Coke.**—At least one fair sized contract for furnace coke for 1911 delivery has been closed, while a number of others are pending, but furnaces are in no haste to place orders, being still somewhat uncertain of policies for next year. A small volume of business has been done in foundry coke, principally for early delivery. Quotations show little change, the following range per net ton, delivered in this territory, about representing the market:

| | |
|---|---|
| Connellsville furnace coke | $3.85 to $4.05 |
| Foundry coke | 4.20 to 4.40 |
| Mountain furnace coke | 3.50 to 3.90 |
| Foundry coke | 3.85 to 4.05 |

**Old Material.**—The bulk of the buying recently has been of the bargain lot order. Consumers are not in particular need of material, but are taking in stock on old orders somewhat more freely, particularly heavy melting steel scrap. Small, prompt lots of this grade have been purchased at prices ranging from $12.50 to $12.75, delivered, although for forward shipment $13 is named. In nearly all grades of material in which business has been done prices are lower, except No. 1 railroad wrought, which is comparatively firm at recently quoted prices. A local merchant was awarded the Government turnings at Washington, on which bids were recently taken, aggregating about 1000 tons, at a higher price than represented by current quotations, which are for small transactions. The following range about represents sellers' ideas of the market for delivery in buyers' yards, eastern Pennsylvania and nearby points carrying a freight rate from Philadelphia, ranging from 45c. to $1.35 per gross ton:

| | |
|---|---|
| No. 1 steel scrap and crops | $12.50 to $13.00 |
| Old steel rails, rerolling | 15.50 to 16.00 |
| Low phosphorus | 18.00 to 18.50 |
| Old steel axles | 19.50 to 20.00* |
| Old iron axles | 26.00 to 27.00* |
| Old iron rails | 17.00 to 17.50* |
| Old car wheels | 13.25 to 13.75 |
| No. 1 railroad wrought | 16.00 to 16.50 |
| Wrought iron pipe | 12.25 to 12.75 |
| No. 1 forge fire | 11.00 to 11.50 |
| No. 2 light iron | 7.00 to 7.50 |
| Wrought turnings | 8.00 to 8.50 |
| Cast borings | 8.00 to 8.50 |
| Machinery cast | 14.00 to 14.50 |
| Railroad malleable | 13.00 to 13.50 |
| Grate bars | 11.00 to 11.50 |
| Stove plate | 10.00 to 10.50 |

* Nominal.

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Pilling & Crane, Philadelphia and New York, have been appointed exclusive sales agents, effective January 2, for the entire pig iron product of the Wharton Steel Company, from the Wharton and Andover furnaces, comprising basic, forge and foundry grades.

## Cleveland

CLEVELAND, OHIO, December 13, 1910.

**Iron Ore.**—Shipments from docks, which picked up somewhat late in November, have again fallen off as a result of the severe winter weather, the ore being frozen and hard to handle. Some shipments have been ordered resumed as soon as the weather becomes milder. Although some consumers bought more ore during the past season than they will need, ore firms claim that there is no resale ore being offered at price concessions. We quote as follows: Old Range Bessemer, $5; Mesaba Bessemer, $4.75; Old Range non-Bessemer, $4.20; Mesaba non-Bessemer, $4.

**Pig Iron.**—The aggregate tonnage sold during the week was extremely small. One local agency reports sales of chacoal iron totaling 2200 tons. The only new inquiries of any size are one for 3000 to 6000 tons of foundry iron and one from a western New York implement manufacturer for 1000 tons of foundry iron, both for first half. Sellers do not expect more than a very limited amount of business until after the first of the year. While No. 2 foundry is firm at $14, local furnace, for Cleveland delivery for spot shipment and first half, this price is being shaded 25c. or more for outside shipment. The usual Valley quotations are $13.75 to $14 for No. 2 foundry for first half. Southern iron is weaker. While the open quotation for No. 2 foundry for the half is $11.25 to $11.50, Birmingham, several sellers will accept business on the $11 basis for delivery through the first half. We note the sale of 400 tons of No. 2 Southern to a local consumer at $11.50, Birmingham, for the first half, but this iron was high in phosphorus. For December delivery we quote, delivered, Cleveland, as follows:

| | |
|---|---|
| Bessemer | $15.90 |
| Northern foundry, No. 1 | 14.50 |
| Northern foundry, No. 2 | 14.25 |
| Northern foundry, No. 3 | 14.00 |
| Gray forge | 13.90 |
| Southern foundry, No. 2 | 15.35 |
| Jackson Co. silvery, 8 per cent. silicon | 19.00 |

**Coke.**—There is some inquiry for foundry coke for the first half from consumers that have not covered, but nearly all of the foundries in this territory are already under contract. Furnace companies are holding off. Prices remain stationary. We quote standard Connellsville furnace coke at $1.45 to $1.55 per net ton, at oven, for prompt shipment, and $1.75 to $1.80 for the first half. Connellsville 72-hour coke is held at $2 to $2.10 for spot shipment and $2.25 to $2.50 for the first half.

**Finished Iron and Steel.**—Mill agencies are getting a fair volume of small orders, but the aggregate is light. Many manufacturers have only a limited amount of work ahead and hence are ordering only such material as they actually need. The structural outlook shows an improvement. Plans have been completed for the new Y. M. C. A. building in Cleveland, and bids are expected to be asked about the first of the year. About 1000 tons of structural material will be required. It is announced that an addition will be built to the Hollenden Hotel, that will require about 600 tons. Bethlehem sections will probably be used. Bids have been asked for for additions to the plant of the Ford Plate Glass Company, Toledo, Ohio, that will take 1000 tons, and an additional 1500 tons will be required for further extensions to be built a little later. Bids will be received for two new high school buildings in Toledo that will require 500 tons of structural material and 1500 tons of reinforcing bars. Considerable other structural work is in prospect, both in Toledo and Detroit. Steel bars and structural material are firm at 1.40c., Pittsburgh, and the leading producers are adhering to that price on plates. As a result of the meeting

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of sheet manufacturers in Pittsburgh last week sheets are firmer, 2.20c. for No. 28 black, 3.20c. for No. 28 galvanized being maintained for the present. Billets are weak. Open hearth forging billets are being offered at $28, Cleveland, or on the basis of $26.50, Pittsburgh. Many steel bar consumers will not specify the full tonnage of their contracts that expire January 1, and some of the mills are extending these contracts until April 1. The demand for iron bars is light, with prices unchanged at 1.30c. to 1.35c., Cleveland. Both of the Cleveland rolling mills shut down this week for a few days. A local selling agency has taken an order for 250 tons of standard section rails for frog and crossing work.

**Old Material.**—The market continues very dull. Outside of an occasional carload, local mills are taking nothing on contracts. Prices on several grades have been reduced. For a few weeks dealers were predicting more activity and somewhat better prices about the first of the year, but this feeling, which for a time kept prices from sagging, appears to have entirely disappeared. The Norfolk & Western Railroad will close December 15 on about its usual tonnage. Dealers' prices, per gross ton, f.o.b. Cleveland, are as follows:

| | |
|---|---|
| Old steel rails | $14.00 to $14.50 |
| Old iron rails | 16.00 to 16.50 |
| Steel car axles | 19.50 to 20.00 |
| Heavy melting steel | 12.75 to 13.00 |
| Old car wheels | 12.50 to 13.00 |
| Relaying rails, 50 lb. and over | 22.50 to 23.50 |
| Agricultural malleable | 11.75 to 12.00 |
| Railroad malleable | 13.00 to 13.50 |
| Light bundled sheet scrap | 9.00 to 9.50 |

The following prices are per net ton, f.o.b. Cleveland:

| | |
|---|---|
| Iron car axles | $21.00 to $21.50 |
| Cast borings | 6.00 to 6.50 |
| Iron and steel turnings and drillings | 6.75 to 7.00 |
| Steel axle turnings | 8.75 to 9.00 |
| No. 1 busheling | 11.00 to 11.50 |
| No. 1 railroad wrought | 12.75 to 13.25 |
| No. 1 cast | 11.50 to 12.00 |
| Stove plate | 10.50 to 11.00 |
| Bundled tin scrap | 11.00 to 11.50 |

## Cincinnati

CINCINNATI, OHIO, December 14, 1910.—(*By Telegraph.*)

**Pig Iron.**—The trade has entered into the usual dull holiday period, and both sales and inquiries are mainly confined to small lots for prompt shipment. Some activity is reported from the St. Louis district, and several round lots of foundry iron are reported as having been sold through branch offices there. Last week a local firm sold a central Ohio melter about 970 tons of various grades of Southern foundry based on a price of $11, Birmingham, for No. 2 foundry, practically all for December shipment. There is yet considerable talk of curtailment in the Northern field, but the furnaces said to be interested are slow in furnishing definite dates for blowing out. Some operators who were said to be willing to book orders at $11, Birmingham basis, for shipment through the first half are now reported as becoming indifferent to taking on business at this figure longer than through the first quarter, and some producers will not accept second quarter orders below $11.50. The Northern price is unchanged, and for prompt or first half shipment $14 to $14.50, Ironton, is quoted, although the first named figure more nearly represents the ruling price. To a small degree the laws in several Western states requiring tax assessments returns to be made January 1 are blamed for causing some consumers to refrain from stocking up until after that date. Malleable is quiet around $14.25 to $14.50, Ironton, for any delivery up to July. For immediate delivery and for the remainder of the year, based on freight rates of $3.25 from Birmingham and $1.20 from Ironton, we quote, f.o.b. Cincinnati, as follows:

| | |
|---|---|
| Southern coke, No. 1 foundry | $14.75 to $15.25 |
| Southern coke, No. 2 foundry | 14.25 to 15.75 |
| Southern coke, No. 3 foundry | 13.75 to 14.25 |
| Southern coke, No. 4 foundry | 13.50 to 14.00 |
| Southern coke, No. 1 soft | 14.75 to 15.25 |
| Southern coke, No. 2 soft | 14.25 to 14.75 |
| Southern gray forge | 13.50 to 14.00 |
| Ohio silvery, 8 per cent. silicon | 19.20 |
| Lake Superior coke, No. 1 | 15.70 to 16.20 |
| Lake Superior coke, No. 2 | 15.20 to 15.70 |
| Lake Superior coke, No. 3 | 14.70 to 15.20 |
| Standard Southern car wheel | 25.25 to 25.75 |
| Lake Superior car wheel | 22.25 to 22.75 |

**Coke.**—The market continues featureless. While there are two or three inquiries for furnace coke that have been in the hands of local agencies for some time, these contracts are not expected to be closed until the first quarter of next year, and even then the business will hardly come to a Cincinnati firm, due to the distant location of the prospective customers. There are two small inquiries from the South for furnace coke for spot shipment, and these are expected to be closed, with the orders probably going to Wise County operations. There has been considerable curtailment in all three fields, but prices appear to be lower in the Connellsville district, where some brands of spot furnace coke are offered as low as $1.45 to $1.55; but in both the Wise County and Pocahontas fields a premium over these figures is obtained of 5c. to 15c. Contract figures range from $1.65 to $1.85, all per net ton, at oven, in all three districts. Spot foundry coke is obtainable around $2 and contract foundry coke at $2.25, per net ton, oven.

**Finished Iron and Steel.**—In some lines the near approach of the holiday season has not had any noticeable effect, and orders for hoops and bands, as well as for some kinds of structural material, are holding up fairly well. The mill price of 1.40c. is generally considered as unshadable, except for some few sizes from independent mills. The warehouse prices on structural material are from 1.75c. to 1.85c.

**Old Material.**—No large tonnages of scrap are being moved, and no improvement is anticipated until well along into next year. Prices for delivery in buyers' yards, Cincinnati and southern Ohio, are as follows:

| | |
|---|---|
| No. 1 railroad wrought, net ton | $12.50 to $13.00 |
| Cast borings, net ton | 4.50 to 5.00 |
| Steel turnings, net ton | 6.00 to 7.00 |
| No. 1 cast scrap, net ton | 11.50 to 12.50 |
| Burnt scrap, net ton | 8.00 to 9.00 |
| Old iron axles, net ton | 17.50 to 18.50 |
| Old iron rails, gross ton | 14.50 to 15.00 |
| Relaying rails, 50 lb. and up, gross ton | 22.50 to 23.50 |
| Old car wheels, gross ton | 12.00 to 13.00 |
| Heavy melting steel scrap, gross ton | 12.00 to 12.50 |

## St. Louis

ST. LOUIS, December 12, 1910.

**Pig Iron.**—Some of the leading sales agencies report a good measure of activity, while others have found the market very dull, not only as regards sales, but inquiries as well. A canvass of the trade developed that several of the recently reported inquiries are still pending, mostly for special iron. The leading interest reports a sale of 2000 tons of Southern No. 2 foundry, for shipment over the first half. A leading house mentions sales aggregating 3000 tons of Northern and Southern iron, mostly foundry grade, to be shipped into St. Louis territory during the first half. Another house reports sales aggregating 3500 to 3600 tons of Southern foundry, for shipment over the first quarter, and the agent for a leading Birmingham furnace placed 500 tons of No. 2 for shipment over the first quarter. The tone of the market continues weak, and doubtless most of the sales have been made at inside figures. Nominally the market is $11 to $11.50 for quick shipment and $11.50 for first quarter, Birmingham basis, but it is intimated that offers of $11 for first quarter can be worked with some furnaces.

**Coke.**—Such business as is possible is confined to small lots for prompt shipment, though we note an inquiry for 40 to 50 cars for shipment over first half, also one for five cars per week, delivery over first half. The market is easier, and prices are nominally $2 and $2.25 for best Connellsville 72-hour foundry per net ton, at oven, the first named figure for spot. Specifications on contract are coming in freely.

**Old Material.**—The only item on the list which is holding steady is relaying rails, while the tone of the market for scrap iron and steel is easier, owing to the light movement, though there is some inquiry. The offerings by the railroads for the past week were as follows: Vandalia, 200 tons; Cotton Belt, 250 tons. Most of the attention of the leading dealers is being given to deliveries on contract. We quote dealers' prices as follows, per gross ton, f.o.b. St. Louis:

| | |
|---|---|
| Old iron rails | $12.00 to $12.50 |
| Old steel rails, rerolling | 12.75 to 13.25 |
| Old steel rails, less than 3 ft | 12.25 to 12.75 |
| Relaying rails, standard sections, subject to inspection | 25.00 to 25.50 |
| Old car wheels | 13.00 to 13.50 |
| Heavy melting steel scrap | 11.75 to 12.25 |
| Frogs, switches and guards, cut apart | 11.75 to 12.25 |

The following quotations are per net ton:

| | |
|---|---|
| Iron fish plates | $11.50 to $12.00 |
| Iron car axles | 18.50 to 19.00 |
| Steel car axles | 17.50 to 18.00 |
| No. 1 railroad wrought | 12.00 to 12.50 |
| No. 2 railroad wrought | 11.00 to 11.50 |
| Railway springs | 10.00 to 10.50 |
| Locomotive tires, smooth | 16.50 to 17.00 |
| No. 1 dealers' forge | 9.00 to 9.50 |
| Mixed borings | 4.50 to 5.00 |
| No. 1 busheling | 10.50 to 11.00 |
| No. 1 boilers, cut to sheets and rings | 9.00 to 9.50 |
| No. 1 cast scrap | 11.50 to 12.00 |
| Stove plate and light cast scrap | 9.00 to 9.50 |
| Railroad malleable | 9.00 to 9.50 |
| Agricultural malleable | 8.50 to 9.00 |
| Pipes and flues | 9.00 to 9.50 |
| Railroad tank and sheet scrap | 9.00 to 9.50 |
| Railroad grate bars | 8.50 to 9.00 |
| Machine shop turnings | 7.50 to 8.00 |

# THE IRON AND METAL MARKETS

## New York

NEW YORK, December 14, 1910.

**Pig Iron.**—The limited inquiry that has appeared in the past week mainly calls for pig iron for delivery in the first quarter of 1911. As a rule buyers are supplied with iron for early needs, and it is true also that with few exceptions they are taking their iron according to contract stipulations. Sales have been limited, the largest reported being for 500 tons of foundry iron for shipment into New Jersey. A New Jersey foundry is inquiring for 1500 tons, and a near-by foundry in New York State is in the market for 1500 tons of one grade of iron and 1000 tons of another. The electrical inquiry heretofore reported has not yet resulted in business. Eastern Pennsylvania foundries have been making lower prices to New Jersey consumers, and the competition of Virginia furnaces on low levels continues. Two or three additional Pennsylvania furnaces are expected to blow out before the end of the year. We quote tidewater deliveries as follows: Northern No. 1 foundry, $15.50 to $15.75; No. 2 X, $15 to $15.25; No. 2 plain, $14.50 to $14.75; Southern No. 1 foundry, $15.50 to $15.75; No. 2, $15.25 to $15.50.

**Finished Iron and Steel.**—A little better feeling seems to exist and prices are a trifle firmer, but no real improvement in business is expected before February. Refusal of railroads to sell their scrap at present prices over any extended period indicates their anticipation of improved conditions. Consumers are coming to the conclusion that further reduction of prices is unlikely, and after the first of the year any that may be holding for lower prices will probably come into the market. The mills apparently attribute lack of orders to lack of needs, and as a rule are reducing output, feeling that price reduction would be fruitless. Plates are very quiet and bar iron also, but it is more or less seasonable, as annual inventory time is near. One of the leading steel bar mills reports a better business so far this month than for the corresponding period last month. The structural business in the week just ended was very light. The lowest bid submitted for the general contract for the post-office at the Pennsylvania terminal in New York exceeded the estimate, and it is possible that the design will be revised and probably that the bids will be readvertised. Plans have been drawn and approved by the supervising architect and bids for the general contract are being asked for a new building for the Bureau of Printing and Engraving at Washington. It may require 4000 to 5000 tons. The Public Service Commission has approved the plans for the extension of the Second and Third avenue lines of the elevated railroad in New York City to White Plains and Woodlawn, and if the franchise is granted by the Board of Aldermen the Interborough Rapid Transit Company will be in the market for about 15,000 tons of structural material and a considerable tonnage of rails. The Virginian Railway bridge work, 2500 tons, has been awarded to the Virginia Bridge & Iron Works. The Pennsylvania Steel Company has the contract for 1700 tons for two bridges for the Pennsylvania Railroad, one at Harrison, N. J., and the other on the New York division. The Washington Irving High School, 2500 tons, has been awarded to the McClintic-Marshall Construction Company. As part of a previous contract, the American Bridge Company will fabricate 7000 tons for a building at Duluth for the Minnesota Steel Company. Levering & Garrigues will get the extensions to the Waterside station of the New York Edison Company, 450 tons, and probably also the Sacramento Court House, 650 tons. Dyer Bros. will probably get the Lowell High School, San Francisco, 950 tons, and the New England Structural Company has the 700 tons for the Bigelow Building, Boston. It is reported that the Public Service Corporation of New Jersey is inquiring for 1000 tons for a power house. Prices remain unchanged. Plain structural material, plates and steel bars, 1.56c. to 1.61c., and bar iron, 1.45c. to 1.50c., all New York. Plain material from store, New York, 1.85c. to 1.95c.

**Steel Rails.**—Some business has been given to a few of the mills for December rolling, but applying on 1911 contracts and to be paid for as though rolled in the new year. This will prevent idleness for most of December, which several mills were facing. The Ontario & Western has placed 1000 tons of its 1911 order and has several inquiries out. The New York Central order is now up for discussion as to certain new points in the specifications. The Carnegie Steel Company has sold 1500 tons to the Clarion & East Brady Electric Railway Company and 500 tons to the Interstate Railroad Company. The Union Pacific has placed 1000 tons with the Illinois Steel Company for early rolling.

**Cast Iron Pipe.**—Weather conditions are unfavorable for construction work, hence the current demand is exceedingly light. Little is now being done in contracting for spring delivery. The lowest bidder on the 1500 tons for New Bedford, Mass., on which proposals were opened December 8, was a Pennsylvania company which named $21.38 per net ton, delivered. The United States Cast Iron Pipe & Foundry Company was low bidder on 3500 tons of 3 to 24 in. water pipe for the city of Cleveland, Ohio, December 12, its bid being $24.35 per net ton, delivered. Carload lots of 6-in. are quoted at $22 per net ton, tidewater.

**Ferroalloys.**—Foreign producers of 50 per cent. ferrosilicon, who have been conducting negotiations for several months with a view to effecting a pool, reached an agreement a few days ago, in consequence of which production will be reduced about one-half. Those in the agreement include all the producers of ferrosilicon in France, Austria, Norway and Sweden. They have been making annually about 30,000 tons of 50 per cent. ferrosilicon. The agreement will result in the closing down of some plants, and it is understood that the parties who curtail their production will be reimbursed from the general profits of sales made by the pool. There is a good demand for ferrosilicon here at present, and it is being sold at from $55.50 to $56.50. There are some good inquiries out for ferromanganese, but prices are weak. It is offered in this market at $38.50 for delivery over the first half.

**Old Material.**—A few sales of heavy melting steel scrap have been made, ranging from 100 tons to 2000 tons. On these sales the prices obtained, delivered at works in eastern Pennsylvania, ran from $12.50 on small lots to $13 on the largest quantities, for delivery over the next three months. A cargo of about 650 tons of Panama scrap was sold at $10.32 per ton, Hoboken, to an eastern Pennsylvania consumer. Almost no transactions are reported in rolling mill stock; as a consequence wrought scrap is weak and prices are wholly nominal. The foundries are this week doing very little in cast scrap, even stove plate being neglected. Dealers' quotations per gross ton, New York and vicinity, are as follows:

| | |
|---|---|
| Rerolling rails | $10.50 to $11.00 |
| Old girder and T rails for melting | 10.00 to 10.50 |
| Heavy melting steel scrap | 10.00 to 10.50 |
| Relaying rails | 20.50 to 21.50 |
| Standard hammered iron car axles | 22.50 to 23.00 |
| Old steel car axles | 16.00 to 16.50 |
| No. 1 railroad wrought | 12.50 to 13.00 |
| Wrought iron track scrap | 11.50 to 12.00 |
| No. 1 yard wrought, long | 11.00 to 11.50 |
| No. 1 yard wrought, short | 10.50 to 11.00 |
| Light iron | 5.00 to 5.50 |
| Cast borings | 5.50 to 6.00 |
| Wrought turnings | 5.50 to 6.00 |
| Wrought pipe | 9.50 to 10.00 |
| Old car wheels | 12.00 to 12.50 |
| No. 1 heavy cast, broken up | 11.50 to 12.00 |
| Stove plate | 9.50 to 10.00 |
| Locomotive grate bars | 8.50 to 9.00 |
| Malleable cast | 12.00 to 12.50 |

## Birmingham

BIRMINGHAM, ALA., December 12, 1910.

**Pig Iron.**—The record of transactions in this market the past week does not show that any decided change has taken place in the views of any parties concerned. The concessions by producing interests have been in the shape of extended deliveries of tonnage required, while the melters have not covered more readily even for their immediate requirements at current quotations. An aggregate tonnage about equal to that reported for the previous week was engaged, but fewer producing interests participated owing to the refusal of some to accept additional business at the prices obtainable. A basis of $11, Birmingham, is still quoted for prompt or comparatively early shipments, with an advance of 50c. per ton over that basis asked for first half or strictly second quarter deliveries. It is true that the leading consumers are not represented in purchases at figures quoted, but recent efforts made by them to shade the $11 basis by offering round tonnage spot shipment at $10.75 were not successful. The sale of a lot of 1000 tons for shipment over the first half was made during the week at $11.25, Birmingham, which represents a concession of 25c. per ton by each party interested. Inquiries for one or more lots of 1000 tons each are now pending, but a disposition to await developments immediately after January 1 is much in evidence. The demand for small lots for prompt shipment is expected to decrease during the coming week by reason of contemplated shutdowns for the holidays, and for that reason the actual movement from furnace yards is now comparatively light. Reports from all sources indicate that smaller stocks will be in the yards of consumers January 1 than on that date for years. It is also no doubt a fact that the trade as a whole is committed for less tonnage for future delivery than has been the case for some time. The present condition of the foundry trade is not considered satisfactory, but the outlook is encouraging and a normal activity early in the new year is anticipated.

**Cast Iron Pipe.**—No report has been made of additional tonnage to be placed at an early date. Nominal quotations are probably lower than last reported, but no actual test of

# THE IRON AND METAL MARKETS

values has been offered for some weeks. All Southern producing capacity continues in operation and stocks have not accumulated to such an extent to become burdensome; however, the tonnage now required for order books is very limited and it is not unlikely that all plants will be closed down for inventory longer than usual. We revise nominal quotations on water pipe, per net ton, f.o.b. cars here, as follows: 4 to 6 in., $19 to $19.50; 8 to 12 in., $18 to $18.50; over 12-in., average $17, with $1 per ton extra for gas pipe. Water pipe fittings and specials are quoted at $50 per net ton.

**Old Material.**—The condition of the market is practically the same as reported last week, but with a larger tonnage in sight for dealers, owing to the cleaning up of foundry plants at inventory time. The status of prices is quite undetermined, but a revision of $1 per ton on all grades is not unwarranted. We quote as follows, per gross ton, f.o.b. cars here:

| | |
|---|---|
| Old iron axles | $14.00 to $14.50 |
| Old iron rails | 12.00 to 12.50 |
| Old steel axles | 13.50 to 14.00 |
| No. 1 railroad wrought | 12.00 to 12.50 |
| No. 2 railroad wrought | 8.00 to 8.50 |
| No. 1 country | 7.50 to 8.00 |
| No. 2 country | 7.00 to 7.50 |
| No. 1 machinery | 9.00 to 9.50 |
| No. 1 steel | 10.50 to 11.00 |
| Tram car wheels | 9.00 to 9.50 |
| Standard car wheels | 10.00 to 10.50 |
| Light cast and stove plate | 7.50 to 8.00 |

## Buffalo

BUFFALO, N. Y., December 13, 1910.

**Pig Iron.**—The aggregate inquiry put on this market the past week would probably not exceed 5000 tons both for current quarter and forward delivery. Ordering has been on a very small scale. There is no quotable change in prices, although the trend might be said to be toward less rigidity on the part of furnaces which have been maintaining the increase made a month ago. The inquiries appearing during the week, however, were not of sufficient tonnage in any instance to induce a lowering of quotations to secure the business. For December and first quarter delivery we quote as follows, f.o.b. Buffalo:

| | |
|---|---|
| No. 1 X foundry | $15.00 to $15.50 |
| No. 2 X foundry | 14.50 to 15.00 |
| No. 2 plain | 14.50 to 14.75 |
| No. 3 foundry | 14.25 to 14.50 |
| Gray forge | 14.00 to 14.25 |
| Malleable | 14.75 to 15.25 |
| Basic | 14.50 to 15.00 |
| Charcoal | 17.50 to 18.25 |

**Finished Iron and Steel.**—The agency of the leading interest reports a good inquiry for miscellaneous bar products, plates and structural material, and most of the others state that the quiet conditions recently prevalent continue. There appears to be some improvement in demand from the automobile trade; two local manufacturing concerns in that line have recently placed orders for considerable tonnages of bar material, one of them contracting this week for six months' requirements, including 500 tons of cold rolled shafting. Some business in sheet piling was taken during the week. In fabricated structural lines there are prospects for the development of plans during the next month or two for a good deal of work for early spring construction, some of which are now being gotten into shape for bids.

**Old Material.**—Inquiry is at a low ebb and only a small amount of business has been transacted. Requests for suspension of shipments on contracts until after the first of the year are being made by mills, owing to the nearness of the inventory season. Prices are unchanged, though largely nominal.

## San Francisco

SAN FRANCISCO, December 7, 1910.

The close of the year is too near at hand for any marked activity. A few contracts are being placed for future delivery, but transactions of this nature are not large, as prompt delivery of most products can be readily obtained. With increasing activity in the small jobbing trade, a better feeling prevails. Numerous large development plans are reaching a stage where business may be expected; building and other improvement work in the country is active, and conditions in general seem favorable for an enlarged movement during the early part of 1911.

**Bars.**—In view of foreign and local competition, Eastern mills are getting a comparatively small proportion of the coast trade. A number of orders have been placed with the Western Steel Corporation, Seattle, by local interests, and this concern will probably get a large share of the business, as stocks of foreign material are reduced. There is a very fair jobbing movement of reinforcing bars. Bars from store, San Francisco, are quoted at 2.20c. for iron and 2.40c. for steel.

**Structural Material.**—Considerable activity is noted all over the coast, and December is expected to bring out a much heavier tonnage than last month. This is due to the letting of a number of jobs which have been pending for some time. The November record in San Francisco was poor, the valuation of permits issued being $1,048,071, compared with $1,425,116 for October, and but little over half the record of November, 1909. Other cities made a good showing, particularly Los Angeles and Portland, Ore., and there is considerable steel construction in the smaller towns. In view of the work expected by local fabricators, mill representatives anticipate an active demand for plain material. Since the first of the month, the Western Iron Works, San Francisco, has taken the Cortez Hotel contract, about 600 tons. Bids have been opened for the Sacramento, Cal., court house, and an award is expected in a day or two. Other contracts likely to come out by the end of the week are the Lowell High School, the Masonic Temple, and the Knights of Columbus building. The Bon Marche department store, Seattle, may also be let shortly. Other old prospects are in about the same position as before, but several new plans are coming out. Figures will be taken early in the year for a large building for the Girls' High School, and contracts will be let within a few months for several large Federal buildings at various points in the interior. The Pacific Rolling Mill Company will furnish about 160 tons for the Perry building in Oakland. The Southern Pacific Railroad has submitted plans for a direct lifting bridge, 80-ft. span, 150 ft. above low water, at San Pedro, Cal. It is reported that the Gilbert Hunt Company will erect a large steel building for a fabricating shop at Walla Walla, Wash. Beams and channels, 3 to 15 in., from store, San Francisco, are quoted at 2.60c.

**Rails.**—The contract for the Geary street municipal road, 2575 tons, has been placed with the Pennsylvania Steel Company, which has also booked an order for about 4000 tons of girder rails and specials for a Los Angeles street line. Greater activity is expected soon after the first of the year, in view of the plans made for street railway development all over the coast, and the increasing requirements of interurban and logging lines. Northern logging interests have depleted the timber supply near tidewater, and many firms are planning long extensions of their lines into the interior next spring. The Southern Pacific has acquired a controlling interest in the principal Los Angeles street and suburban lines, and it is reported that its entire system in that district will be operated by electricity, numerous extensions being added. It is reported that the Monterey electric road will install a double broad-gauge track between Monterey and Salinas, Cal. The Northern Electric Company is planning extensive switching yards at its Sacramento terminal. A new street railway will be built at San Rafael, Cal.

**Plates and Sheets.**—Tank plates have been rather quiet for some time, but inquiries from the oil interests indicate the prospect of a better movement after the new year opens. The reported failure of a new 1,000,000 bbl. concrete oil reservoir near San Luis Obispo, Cal., may cause a renewal of interest in steel tanks. The Union Oil Company is now operating its own tank shop at Oleo, and has ordered a considerable tonnage of material. The current movement of sheets is better, and in view of numerous inquiries from large consumers an active market is expected after the first of the year. The Lake Hemet Water Company has placed an order in Los Angeles for several thousand feet of 30-in. sheet steel pipe.

**Merchant Pipe.**—A few small orders are still being placed by jobbers, but they are limiting their purchases, buying little for future delivery, as stocks, though somewhat broken up, are still large, and the mills are able to make prompt deliveries. The distributive movement is quiet here, but fairly active in the interior, much of the small trade going to jobbers at Sacramento, and a better movement from the mills is expected in January and February. There is a better feeling in oil pipe, though the present tonnage is limited. The consuming demand for oil has increased remarkably in the last few months, while the output is decreasing, and work is being resumed on many wells. Considerable inquiry is reported for line pipe. A large distributing system for natural gas in the oil fields has been talked of, and if carried out would require a heavy tonnage of pipe, but plans in that direction are only tentative.

**Cast Iron Pipe.**—The order placed with the Crane Company by the Bay Cities Water Company included only about 3000 tons of cast iron pipe. This order, however, is only preliminary, as it is reported that about $3,000,000 will be spent for pipe, most of it being cast iron. The United States Pipe Company has taken an order for 2000 tons of 24 to 30 in. for the city of Los Angeles, and the city of San Jose, Cal., will receive bids December 19 for 2500 ft. of 12-in. The Long Beach Water Company, Long Beach, Cal., is preparing to lay a number of new 12-in. mains. The Domestic Gas Company of Los Angeles plans to lay a large amount of pipe within the next few months. Tentative plans have been formed for a network of gas mains connecting all the towns in the vicinity of Los Angeles, by means of which the opera-

# THE IRON AND METAL MARKETS

tion of existing plants would be placed on a more economical basis. This work, if carried out, will require an extremely heavy tonnage, but the outcome of the project is by no means assured. Plans are being made for an extension of the water system of Porterville, Cal.

**Pig Iron.**—Foundry pig iron remains extremely dull, owing to the small amount of work in hand and the uncertain outlook for the local foundries. There is little pressure to sell on the part of importers, however, and while prices are not very well established it is difficult to obtain anything under $22. The principal importations of Chinese iron are now taken up by the Western Steel Corporation. Southern foundry iron is nominally valued at $21. Southern pig iron has not been used to any extent here in the past, but with several new steel plants starting operations the demand is likely to be of some importance. An inquiry for a considerable tonnage of basic iron is now in the market. The new open-hearth casting plant of the Columbia Steel Company is now in operation, with sufficient orders booked to assure steady operation throughout the first half of 1911, and the open-hearth furnace and rolling mill of the Doak interests at South San Francisco will be started within a few months. Both these concerns are expected to be large consumers.

**Old Material.**—Increasing interest is noted in steel melting scrap, one large contract having been let for first quarter delivery. The outlook is good for a heavy movement in this line next year. Cast scrap is scarce and prices are firm. Rerolling rails and wrought scrap receive little attention, and relaying rails, which are offered freely, are neglected. Quotations are as follows: Cast iron scrap, per net ton, $18; steel melting scrap, per gross ton, $12.50; wrought scrap, per net ton, $13.50; rerolling rails, per net ton, $15.

## Metal Market

NEW YORK, December 14, 1910.

### THE WEEK'S PRICES

Cents Per Pound.

| | Copper. | | | Lead. | | Spelter. | |
|---|---|---|---|---|---|---|---|
| Dec. | Lake. | Electrolytic. | Tin. | New York. | St. Louis. | New York. | St. Louis. |
| 8 | 13.00 | 12.87½ | 38.40 | 4.50 | 4.40 | 6.00 | 5.85 |
| 9 | 13.00 | 12.87½ | 38.35 | 4.50 | 4.35 | 6.00 | 5.85 |
| 10 | 13.00 | 12.80 | .... | 4.50 | 4.35 | 5.85 | 5.75 |
| 12 | 13.00 | 12.75 | 38.67½ | 4.50 | 4.35 | 5.85 | 5.75 |
| 13 | 13.00 | 12.75 | 38.50 | 4.50 | 4.35 | 5.85 | 5.75 |
| 14 | 13.00 | 12.75 | 38.55 | 4.50 | 4.35 | 5.85 | 5.75 |

Pig tin continues high, but is neglected. Lake copper is softer and electrolytic lower. Spelter has receded. Lead is quiet and weak.

**Copper.**—Not since the Producers' Association has been issuing figures of copper production and consumption has its monthly report had so little effect on the trade as did that issued December 8, covering the November statistics. While the report was generally considered good, consumers took no interest in it and refused to be coaxed into the market. The London market was not affected, and consequently there were no orders for export. Disappointed sellers of copper, who were expecting a buying movement following the report, have been shading prices, but even with the inducements there are no reports of sales of any consequence. While lake is nominally 13c., certain brands can be had at something under that price. Electrolytic copper is weaker than lake and is being freely offered at 12.75c. The London market closed to-day with spot copper selling at £56 12s. 6d. and futures at £57 8s. 9d. Sales amounted to 600 tons of spot and 600 tons of futures. The market closed firm.

**Pig Tin.**—Pig tin reached a new high point yesterday, when after steady advances all week sales were made in this market at 38.50c. This is an advance of 55 points over last week, when the high price of the year was established. As far as buying is concerned, the market has been stale, as consumers have naturally decided to hold off, and only those actually in need of the metal have been buying and then only in very small quantities. The London syndicate seems to have good control of the situation, as stocks are not over plentiful in this market, and the American consumer is obliged to bow to the will of the London operators. In New York to-day pig tin was sold for 38.55c. The London market closed with spot tin selling at £175 17s. 6d. and futures at £175 17s. 6d. The sales amounted to 170 tons of spot and 340 tons of futures. The market closed steady.

**Tin Plates.**—The market has very little interest. Buyers are few and far between, and stocks are plentiful. The price for 100-lb. coke plates continues at $3.84.

**Lead.**—Outside sellers of lead in St. Louis have been offering it freely at 4.35c., and this has tended to weaken the New York market. There is only a light demand, and some outside holders are showing a special anxiety to sell. Outside sellers in this market are now getting the price made by the American Smelting & Refining Company, which is 4.50c.

**Spelter.**—Conflicting reports are in circulation. It is declared in some quarters that people recently interested in advancing prices have become tired of supporting the market and early in the week were wiring about the country with offers to sell at 15 points less than the price made last week. At any rate, spelter is weaker in St. Louis, and transactions have been made there at prices equal to 5.85c., New York. Even at the reduced price, consumers fail to show any great amount of interest, and some of the larger buyers are determined in their declaration to hold out for lower prices. Taken on the whole there appears to be a deadlock between the sellers and buyers. Some think that offerings are now being made at reduced prices to test consumers and ascertain how much they need the metal. The price to-day is 5.70c. to 5.75c., St. Louis, and 5.85c., New York.

**Antimony.**—Conditions in the antimony market have not changed during the week. Price cutting continues. Hallett's is selling at 7.75c.; Cookson's at 8c.; Chinese grades, 99 per cent. guaranteed, 7½c.; Hungarian grades, 7c. to 7.12½c.

**Old Metals.**—Consumers are doing little in the market. Dealers' selling prices are nominally unchanged, as follows:

| | Cents. |
|---|---|
| Copper, heavy cut and crucible | 12.50 to 12.75 |
| Copper, heavy and wire | 11.75 to 12.00 |
| Copper, light and bottoms | 11.00 to 11.25 |
| Brass, heavy | 8.25 to 8.50 |
| Brass, light | 7.00 to 7.25 |
| Heavy machine composition | 11.25 to 11.50 |
| Clean brass turnings | 8.00 to 8.25 |
| Composition turnings | 9.00 to 9.50 |
| Lead, heavy | 4.20 to 4.25 |
| Lead, tea | 3.95 to 4.00 |
| Zinc scrap | 4.30 to 4.40 |

**Metals, Chicago,** December 13.—There is a fair amount of current business in copper, and occasional orders are taken for March and April shipment, but not much business has been done beyond February. While copper is a shade weaker in the East, the change is not sufficient to affect the Chicago quotation materially. Tin is higher. Lead and spelter are dull and spelter is lower. We quote Chicago prices as follows: Casting copper, 13c.; lake, 13¼c., in carloads, for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 39¼c.; small lots, 41c.; lead, desilverized, 4.45c. to 4.50c., for 50-ton lots; corroding, 4.70c. to 4.75c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.85c. to 5.90c.; Cookson's antimony, 10¼c., and other grades, 9c. to 10c., in small lots; sheet zinc is $7.75, f.o.b. La Salle, in carloads of 600-lb. casks. On old metals we quote for less than carload lots: Copper wire, crucible shapes, 12½c.; copper bottoms, 10½c.; copper clips, 12c.; red brass, 11c.; yellow brass, 9c.; lead pipe, 4¼c.; zinc, 4¼c.; pewter No. 1, 24½c.; tin foil, 30c.; block tin pipe, 33c.

**Metals, St. Louis,** December 12.—Lead has ruled quiet the past week and is quoted at 4.40c.; spelter is lower, and held at 5.70c., both at East St. Louis. Zinc ore is meeting with a limited demand, and the market is unsettled at $43 to $45 per ton, Joplin base. Tin is held at 38.75c. per pound; antimony (Cookson's), 8.10c.; lake copper, 13.35c.; electrolytic, 13.20c., all at St. Louis. The leading manufacturer reports a fair demand the past week for finished metals; during the past 11 months its sales of coffin hardware metal west of Pittsburgh footed up a total of 4,700,000 pounds.

## Iron and Industrial Stocks

NEW YORK, December 14, 1910.

For an exceedingly dull week in stock transactions, the market has been surprisingly firm. From Wednesday to Saturday a steadily rising tendency occurred, the maximum prices generally for the period under review having been reached on the latter day. On the opening days of the current week a slight reaction took place. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

| | | | |
|---|---|---|---|
| Allis-Chalm., com | 8⅛ | Railway Spr., pref. | 92¼- 93 |
| Beth. Steel, com | 28¼- 29⅞ | Republic, com | 29⅞- 31¼ |
| Beth. Steel, pref | 56⅝- 59 | Republic, prof | 92⅞- 93½ |
| Can, com | 8⅞- 9¼ | Sloss, com | 48½- 50¼ |
| Can, pref | 76⅝- 77½ | Pipe, com | 15⅝- 16 |
| Car & Fdry, com | 47⅞- 50⅝ | Pipe, pref | 54 |
| Car & Fdry, pref | 112 -115½ | U. S. Steel, com | 70 - 74 |
| Steel Foundries | 40⅝- 44 | U. S. Steel, pref | 115 -116⅝ |
| Colorado Fuel | 29¾- 32 | Westinghouse Elec. | 65 - 67¾ |
| General Electric | 149¾-154¾ | Am. Ship, com | 76½ |
| Gr. N. ore cert | 54 - 56 | Am. Ship, pref | 111¼ |
| Int. Harv., com | 108¼-111½ | Chi. Pneu. Tool | 40⅝- 40¾ |
| Int. Harv., pref | 121 -121⅝ | Cambria Steel | 41⅝- 43 |
| Int. Pump, com | 39⅝- 41 | Lake Sup. Corp | 26⅜- 27½ |
| Locomotive, com | 34 - 37 | Pa. Steel, pref | 103 -103½ |
| Locomotive, pref | 105 | Warwick | 10½- 10⅝ |
| Pitts. Steel, pref | 101 | Crucible St., com | 12 - 13 |
| Pressed St., com | 28 - 31½ | Crucible St., pref | 75⅜- 78 |
| Pressed St., pref | 94 | Harb.-W. Ref., pref | 95 |
| Railway Spr., com. | 30½- 32 | | |

**Dividends.**—Phelps-Dodge & Co. have declared a regu-

lar quarterly dividend of $2.50 and an extra dividend of $2, payable December 30.

The American Car & Foundry Company has declared the regular quarterly dividends of ½ of 1 per cent. on its common stock and 1¾ per cent. on the preferred stock, payable January 2.

The Torrington Company has declared a regular semiannual dividend of 3½ per cent. on the preferred stock. The directors have voted to call a stockholders' meeting shortly to authorize an increase in the common stock from $2,000,000 to $2,200,000. This may be preliminary to the declaration of a 10 per cent. stock dividend to holders of the common stock; such action would be taken in time for participation in the regular semiannual cash dividend usually paid February 1.

The American Iron & Steel Mfg. Company has declared the regular quarterly dividends of 1¼ per cent on the common and preferred stock, payable January 2.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has declared a quarterly dividend of 2 per cent.

The International Harvester Company has declared the regular quarterly dividend of 1 per cent. on its common stock, payable January 14.

The Washburn Wire Company has declared the regular quarterly dividend of 1¾ per cent. on its preferred stock, payable January 3.

The Sloss-Sheffield Steel & Iron Company has declared the regular quarterly dividend of 1¾ per cent. on its preferred stock, payable January 3.

The Empire Steel & Iron Company has declared a dividend of 2 per cent. for the six months ending December 31.

The Yale & Towne Mfg. Company has declared a quarterly dividend of 1½ per cent. and a special dividend of 1 per cent., payable January 3.

## Notes on Prices

**Rope.**—The demand for rope continues in small quantities as it has for some time, the trade in general buying only for immediate necessities. This policy has been pursued for so long a time that stocks in merchants' hands must necessarily be small, and larger orders may naturally be expected by manufacturers when business commences to move in a larger way. The following quotations represent prices to the retail trade in the Eastern market for rope 7-16-in. in diameter and larger, with card advances for smaller sizes: Pure Manila of the highest grade, 8¼c. to 9¼c. per pound; second grade Manila, 7¾c. to 8¼c. per pound; hardware grade, 7¼c. to 7¾c. per pound; pure Sisal of the highest grade, 6¾c. per pound; second grade 6¼c. per pound; jute rope, ¼-in. and up, No. 1, 5¾c. to 6¼c. per pound; No. 2, 5¼c. to 5¾c. per pound.

**Linseed Oil.**—Eastern crushers have reduced the price of oil two cents per gallon. As Argentine flaxseed can be laid down in the West at a lower price than domestic seed is bringing and foreign oil can be brought into the country at less than domestic oil can be purchased for, the market has weakened. Oil contracts for delivery April to September, 1911, are being placed at much below present prices. Buying for immediate requirements is for small lots. The following quotations represent New York prices in five-barrel lots or more:

| | Cents. |
|---|---|
| State, raw | 95 |
| City, raw | 93 |

Linseed, in lots less than 5 bbl., 1 cent advance per gallon.
Boiled oil, 1 cent advance over raw.

**Spirits Turpentine.**—Buying at this point is moderate, while in the South there is a continued demand for export. New York quotations in five-barrel lots are as follows:

| | Cents. |
|---|---|
| In oil barrels | 78 |
| In machine barrels | 78½ |

Less than 5-bbl. lots, ½ cent advance per gallon.

## More Steel Trade Meetings.

PITTSBURGH, PA., December 14, 1910.—(*By Telegraph.*)—A largely attended meeting of tin plate manufacturers was held in the Fort Pitt Hotel, Pittsburgh, yesterday. E. T. Weir of the Phillips Sheet & Tin Plate Company, Weirton, W. Va., was chairman. The conditions in the trade were thoroughly discussed, and it was the opinion of those present that, based on present prices of tin bars and pig tin, prices on tin plate were low enough and should be absolutely maintained. There has been some demoralization in the prices of black plates, and as a result of the meeting it is probable that in the future the market on that product will be more regular than it has been in the past. Another meeting will probably be held at an early date.

A meeting of manufacturers of plates has been called to be held in Pittsburgh to-day, and a meeting of steel bar makers is to be held here on Thursday.

## American Iron and Steel Institute Committees

At the last meeting of the directors of the American Iron and Steel Institute, held in New York, a Committee on Contract Obligations was appointed, consisting of Willis L. King of the Jones & Laughlin Steel Company, as chairman; E. A. S. Clarke, president of the Lackawanna Steel Company, and Samuel Mather of Pickands, Mather & Co. This committee will consider the suggestions brought out in the paper of Willis L. King before the New York meeting of the institute looking to the better enforcement of contracts for the purchase of iron and steel. The committee will consider what measures should be taken in this direction, such as shortening of the sale period, cancellation of tonnages unspecified within a certain time, and the abolition of guarantees against decline. What is aimed at in part is to prevent the buyer from contracting beyond his requirements and the seller from selling beyond his ability to deliver. William B. Schiller, president of the National Tube Company, was made chairman of the committee heretofore appointed to consider the feasibility of a six-day week in continuous operations at iron and steel works. James A. Campbell, president of the Youngstown Sheet & Tube Company, was elected a director of the institute to succeed W. J. Filbert, comptroller of the United States Steel Corporation. Charles Kirchhoff was chosen as the representative of the institute on the Committee on Nomenclature of Iron and Steel, which was appointed several years ago by the International Association for Testing Materials.

The institute has adopted as its seal the one proposed by T. W. Robinson, first vice-president of the Illinois Steel Company, for the menu card of the dinner given at Chicago when the institute and its foreign guests visited that city in October. It was described on that occasion by Mr. Robinson as an allegory of the principles on which the institute is built. "Right Makes Might" is the chief inscription. Of the symbolism of other features, Mr. Robinson says: "In its detail appear the sword and spear transfused by the Alchemy of Wisdom into the plowshare and the pruning hook. From the crucible, for immemorable time the melting pot of nations, there springs the steel of war and the steel of peace. These, however, but surround the central motif, the spirit of co-operation, symbolized by the Bird of Immortality—the Phoenix—rising from the ashes of discord, enmity and strife, into the rays of enlightened life. In its finality the seal, bound by the sturdy oak and wreath with leaves of olive, is a laurel to the strength of unity and the gospel of co-operation."

The Railway Specialty & Supply Company, Monadnock Block, Chicago, changed its name December 1 to the P. & M. Company. This change was made because of the frequent confusion of its old name with the numerous other supply and equipment companies in the railroad trade. The company was organized in 1906 to manufacture and market the P. & M. boltless anti-rail creeper. This device has met with such success that it was deemed wise in adopting a new name to choose one that would identify the company as its manufacturer.

Tashenberg Bros., proprietors of the Buffalo Boiler Works, Buffalo, N. Y., have purchased the plant of the Frontier Boiler Works adjoining on Illinois street, and will consolidate it with their own business. They will also establish a branch plant at Erie, Pa. No new machinery or equipment will be required at present.

# The Machinery Markets

The machinery trade is irregular. A better business is noted in Chicago and there is a good run of inquiries. In that city, as well as in New York, there is an increased miscellaneous business, although inventory work is interfering to an extent with buying. There is a rather heavy demand for machine parts and a good single order business for replacement. Detroit machinery plants are steadily increasing their output and there is a demand in that territory for skilled labor. There are indications of price cutting in some lines in Milwaukee, but the call for heavy machinery there is improving. A good call for general machinery exists in the Northwest and on the North Pacific Coast and business in those sections is well distributed. Things are a little quieter in the South, but the trade there has an optimistic tone. Similar conditions exist in the Southwest. A feature of the trade in the Farther Central West is an excellent call for mining equipment. Extensive developments in that line are under way and good sales are being made of air compressors and power units, both gasoline and electrical. Taken altogether, business in general looks better than it did a week ago.

## New York

NEW YORK, December 14, 1910.

The unusual amount of inventory work now going on is interfering to an extent with machinery buying, but nevertheless trade is slightly better than it was a fortnight ago. There is a good call for single tools, and at least two New York representatives of large machine tool manufacturers booked more single orders during the last 10 days than they did during the entire month of November. Some of this business came from the railroads, and it is very apparent that most of the great repair shops in the East are crippled because of inadequate or obsolete working equipment. As is usual during periods of shop economy there is an extraordinary call for repair parts, and this has resulted in increasing the business of some shops at least. Manufacturers of outdoor equipment have fared better of late than business in other branches of the machinery trade. The work on the Panama Canal and extensive operations on the Catskill water works have contributed a great deal of support to that branch of business, and the unusual amount of municipal enterprises in the way of water works, &c., in various parts of the country is creating an especially good demand for hoisting engines, derricks, dredges, steam shovels and similar equipment.

The Simms Magneto Company, 1780 Broadway, New York, is now making inquiries for a line of machine tools to be installed in its new plant in course of construction at Watsessing, N. J. The plant is well under way, but the matter of buying machinery was left in abeyance because of Mr. Simms' absence in Europe. He returned a short time ago and it is expected that active buying will soon begin. The company's plant will be 150 x 300 ft. and two stories. The plant will be fully equipped for the manufacture of magnetos and from all accounts a large line of machine tool equipment will be installed. William Shuler is the purchasing agent.

It is understood that the mechanical engineers of the Pennsylvania Railroad are going over the company's large repair plants at Altoona, Pa., and Olean, N. Y., with a view to making up a list of immediate machinery requirements. There is a great deal of equipment in the Olean plant especially that is antique, according to people familiar with conditions there, and from all accounts the list of machinery requirements for replacement in that shop will be large.

The Transmission Gear Company has been organized, with offices at 96 Broadway, New York, to handle the Harris transmission gear. The company is at present having its equipment made under contract and has not decided as to whether it will build a plant later on or not.

The Gamon Meter Company is preparing to build at 280-294 South street, Newark, N. J., a new plant for the manufacture of water meters. The building will be 30 x 208 ft. and two stories. A steam power plant and two elevators will be installed.

D. B. Dunham, manufacturer of carriage tops, &c., Rahway, N. J., is having plans prepared for a five-story brick building, 100 ft. square, to be built at Central avenue and Fourth street, Newark, N. J. The equipment will include a steam plant, elevators, &c.

The Buffalo Mfg. Company, manufacturer of filters and water coolers, is making additions to its factory at 191 Clinton street, Buffalo, N. Y.

The Cyclone Grate Bar Company, Buffalo, N. Y., has increased its capital stock from $25,000 to $50,000, for the purpose of enlarging its manufacturing facilities. The offices of the company are at 827 White Building.

The Frontier Glove Company, Buffalo, N. Y., T. Nevin, M. H. Dunn and W. F. Strasmer, directors, has been incorporated, with a capital stock of $25,000 and will equip a factory for the manufacture of gloves.

The Syracuse Safe Company, Syracuse, N. Y., will add two stories, 122 x 131 ft., to the building on the Phœnix Foundry Company's property at East Water and Orange streets, which it recently purchased.

The Middletown Chemical Company, recently incorporated at Middletown, N. Y., with a capital stock of $50,000, will equip a plant for the manufacture of chemicals and also for the chemical treatment of silk and other fabrics. The directors are J. S. Mack, Allentown, Pa., and G. Walker.

The Aluminum Company of America is arranging to make extensive additions and improvements to its plant at Massena, N. Y.

The Syracuse Malleable Iron Company, Syracuse, N. Y., has commenced construction of its new foundry building, 150 x 200 ft., on North Geddes street.

The Dyneto Electric Company has been incorporated at Elbridge, Onondaga County, N. Y., with a capital stock of $60,000, to manufacture electrical appliances. A. E. Doman, C. L. Amos and A. A. Costello, Syracuse, are the incorporators.

The works of the John R. Keim Company, Kensington avenue and Erie Railroad, Buffalo, N. Y., which were damaged by fire recently, are to be repaired at once and large additions made. The plant is owned and operated by the Ford Motor Car Company, Detroit, for the manufacture of pressed steel parts for automobiles.

The Buffalo Lounge Company, Exchange street and the Lake Shore Railway, Buffalo, N. Y., has purchased the five-story brick manufacturing building at 588-594 Louisiana street and will equip it, as its factory No. 4, for the manufacture of lounges and furniture.

The W. A. Case & Son Mfg. Company, manufacturer of steam fitters' supplies, has purchased the four-story brick factory of the Wagner Machine Company, at Perry and Mississippi streets, Buffalo, N. Y., and will fit up and use it for the manufacture of refrigerating machinery.

The Wm. Simon Brewing Company, Clinton and Emslie streets and New York Central Railroad, is building an extensive bottling plant and will install complete electrically operated pumping and bottling equipment, with electric motors, &c.

James Shufelt, Oswego, N. Y., has plans completed for a three-story factory and one-story engine and boiler house, to be erected in that city for the manufacture of underwear.

The Marcellus & Otisco Lake Railroad has plans in preparation for a three-story factory and power building, 50 x 150 ft., concrete construction, to be erected at Marcellus, N. Y. John Stewart is manager.

Geo. Schaaf, 547 East Utica street, Buffalo, N. Y., is building a three-story machine shop and factory building at Lansing street and Military road, adjoining his present plant.

The Standard Oil Company is building a brick addition to the power plant at its Atlas Works, Elk and Babcock streets and the Buffalo Creek Railroad, Buffalo, N. Y.

The erection of a fertilizer plant with a capacity of 75,000 tons of fertilizer per year is contemplated at Rochester, N. Y., by Swift & Co., Chicago, Ill. Estimated cost, $500,000.

### Catalogues Wanted

The Eccles & Smith Company, San Francisco, Cal., desires catalogues covering general machine shop tools and supplies.

The Fay Machinery Company, 126 Liberty street, New York, desires catalogues of mechanical specialties and supplies, electrical contractors' equipment, &c., with a view to making selling connections.

# THE MACHINERY MARKETS

## Chicago

CHICAGO, ILL., December 13, 1910.

Business is picking up in Chicago territory and dealers during the past week or ten days have been figuring on a good run of inquiries. There are no large lists reported in the market, and the demand is of a miscellaneous character, but has reached a volume which is quite encouraging after several months of dull business. Some good sales of used tools have been closed, and sales of new equipment have also been made for immediate delivery, but in the natural course of events the greater portion of the inquiries now pending will not grow into actual sales until after the first of the year. A favorable indication is that the supply houses have been doing a good business lately. The corporation tax requires all industries to take inventory at the end of the year, and as this period approaches there is a universal tendency to put off buying until the new year so as to reduce stocks. The supply people, however, are profiting by the fact that people have generally exhausted their stocks, which they had supposed would carry them over into the new year. There is no doubt that the business atmosphere will show a general improvement after inventories have been completed. The results of the year show up better on the books than current conditions would indicate. This will be quite a general condition and will undoubtedly bring the dealers a good deal of inquiry in January, which may or may not grow into an active period in the business, depending upon the growth of strength in other lines. Meantime, however, machinery men are generally feeling better, because it looks as though they have passed a turning point in a period of depression.

The Chicago Machinery Exchange, of which Waldemar Giertsen is proprietor, has under construction a new building at West Washington and Ann streets, Chicago. The building is 100 x 200 ft., three stories, of mill construction, with a floor space of 60,000 sq. ft., and is designed as headquarters for the sale of wood working machinery. The exchange has the agency in Chicago territory for several of the largest manufacturers of wood working machinery, and contemplates renting floor space and desk room to manufacturers of other non-competing lines. The exchange management will take care of machines that are exhibited in this manner and its salesman will give the necessary attention to prospective customers when the representative of the manufacturer is not present.

The Board of Education, Chicago, has plans prepared for a high school building which will be erected at a cost of $600,000, exclusive of the equipment, for which another $100,000 will be expended. The first floor of the building will contain a machine shop, wood working shop, a foundry and a forgeroom.

William G. Krieg, 172 Washington street, Chicago, is preparing plans for a factory to be erected for the Midland Terra Cotta Company. It will comprise four one-story units, 75 x 150 ft., a one to four-story mill and power house, 60 x 152 ft., one-story office building, 36 x 66 ft., one-story barn, 40 x 50 ft., and kilns.

The Leonard Construction Company, Chicago, will begin work shortly on a three-story addition to a factory and warehouse for the Velie Motor Vehicle Company, Moline, Ill.

The Union Iron Works, Decatur, Ill., has purchased additional ground adjoining its plant and contemplates the erection of two new buildings early in the spring. One of the proposed buildings will be used as a machine shop in which machine tools will be driven by individual motors. A new foundry is also under consideration and an addition to the present building used as an office and wood shop. The estimated cost of these improvements is $50,000.

The Illinois Valley Gas & Electric Company, Joliet, Ill., has purchased the plant of the Henry Electric Light & Power Company, Henry, Ill., and the plants at Chillicothe and Lacon, Ill. Extensive improvements will be made to the Lacon plant and new machinery installed.

Grossmann & Proskauer, constructing and consulting engineers, Old Colony Building, Chicago, are in the market for gas producers, suction gas power plants, foundry machinery and equipment, forge machinery and equipment, and steam power plants, in connection with two large manufacturing plants that they are designing.

## Philadelphia

PHILADELPHIA, PA., December 12, 1910.

While there has been no change in the character of the demand, merchants have taken a somewhat larger number of orders, mostly for the smaller class of tools. A number of these orders had been pending for some time and the volume of business under negotiation is steadily declining, the trade becoming more dependent on current business. Several inquiries for small tools have come from the local railroads recently, but there is still no indication of more general buying on the part of those interests. Manufacturers of tools, both of the standard and special types, continue to report business as irregular and look for little betterment in the immediate future.

Second-hand machinery merchants report quiet conditions and very little new business in second-hand engines, boilers or electrical equipment is noted.

The S. S. Wentzell Machine Company, manufacturer of bottle washing machinery, is taking bids for a new brick and concrete manufacturing plant, 100 x 150 ft., two stories, to be erected at Fiftieth street and Parkside avenue. The principal equipment will be moved from its present plant, 439 North Twelfth street, although some minor equipment may be required but has not yet been considered.

"P. S. M.," care Philadelphia office of *The Iron Age*, is inquiring for a second-hand 100-kw. 110-volt direct current generator, directly connected to a standard make of steam engine. The equipment must be in first-class condition and the make of both engine and generator should be stated.

The Pooley Furniture Company has, it is reported, awarded contracts for the building of a four-story factory, 50 x 166 ft., of brick and concrete, to replace that portion of its plant recently destroyed by fire.

The Frick Company, Waynesboro, Pa., has under consideration the erection of a new foundry building, but has not decided when it will go ahead with the work.

The Electric Speedometer Company is the name recently adopted by the Electric Speedometer and Dynamometer Mfg. Company, 1420 New York avenue, Washington, D. C., under which it will transact business. The officers of the company and the nature of its business remain unchanged. Earl Wheeler is general manager.

While it has been reported that Rowland Firth & Sons, Phillipsburg, N. J., would build a steel casting plant in connection with their works in that city, no definite plans in connection with the project have so far been decided upon.

The Keeley Stove Company, Columbia, Pa., is having plans prepared for a four-story brick factory addition, 52 x 112 ft., for which it will take bids in the near future.

Weaver & Wittle, Labanon, Pa., are building at Front and Lehman streets, in that city, a concrete manufacturing building, 40 x 110 ft., basement and two stories. This building will be used for the manufacture of gasoline engines and novelties, as well as general machine repair work. A small quantity of machinery will be required. They will also manufacture, under the name of Weaver & Co., a new wheat separator, for which purpose woodworking machinery will be installed. The new plant is expected to be ready for occupancy about January 1.

## New England

BOSTON, MASS., December 13, 1910.

The machine tool trade remains quiet. Buyers are frank in their intentions to defer the placing of orders until after January 1, or are stipulating that machinery ordered now shall not be billed this year. Foreign business is improving. For example, the Potter & Johnston Machine Company, Pawtucket, R. I., with its large works running overtime, can quote no deliveries better than May 1, 1911, and a large percentage of the orders are from European customers. Other machine tool people are feeling the same influence in varying degrees. The supply trade is good to an extent all out of proportion to machinery. Probably it is a little under the existing line of normal in the curve of demand. But the fact that one old established, always progressive house finds the supply end of its business for the year to date in excess of previous records, is significant.

The sugar and coffee machinery manufacturers report a satisfactory demand, largely for export. The textile machinery industry is rather dull. So are the foundries. With electrical equipment deliveries are not good. The wire business is active, relatively speaking.

The current opinion is that spring business, asserting itself in January, will show a decided improvement. The deduction is probably arrived at through the process of elimination; substantial reasons why conditions should not improve are not easily found. Many experienced and wise observers agree in this opinion. The general desire to make the best possible showing for the year's business, through the medium of the inventory, is retarding buying at present. The removal of the influence, with the resultant accrued business, should have a stimulating effect.

The aeroplane is beginning to be a factor in New England industry. Several concerns are already established to build flying machines. The latest announcement is that a company is forming in Waltham, Mass., headed by C. H. Metz, manufacturer of motor vehicles, to manufacture aeroplanes and their motors. The purpose is to establish a new factory. Established houses and individual designers are

# THE MACHINERY MARKETS

paying much attention to motors for heavier than air machines. The supply trade is feeling this influence to quite an appreciable extent.

The Oven Equipment & Mfg. Company, Stamford, Conn., manufacturer of sectional ovens and inclosed flame gas burners, will erect a new factory at New Haven, Conn. The building will be of brick, 60 x 200 ft., and two stories, with concrete roof and floors. It will not be ready for occupancy until late next spring, and the machinery requirements have not been made up. Victor Morris Tyler is the president of the Company; Ronald Crawford, vice-president, and Edgar L. Hartpence, treasurer.

The Brown & Sharpe Mfg. Company, Providence, R. I., has brought out a new plain milling machine known as the No. 2 B No. 13 B., the capacity of which is 34 x 6 x 12 in.

Industrial projects just announced include the following: Woodworking mill for the Benjamin Chase Company, Derby Village, N. H., to replace plant destroyed by fire December 11, with loss of $20,000; Platt Brothers, Oldham, England, reported intention to erect machine shops at Fall River, Mass., to take care of the firm's American trade in cotton mill machinery; Providence Braid Company, Pawtucket, R. I., two-story brick addition, and projected new mill. The new plant of the National Seat & Novelty Company, Hop River, Conn., will be 40 by 100 ft., one-story. Rawitzer Brothers, Stafford Springs, Conn., textiles, will replace mill recently burned by plant at Greystone, Conn.

The S. A. Woods Machine Company, South Boston, Mass., manufacturer of woodworking machinery, is contemplating important improvements to its works in the spring, which will largely increase its manufacturing capacity.

The National Machine Tool Company, 253 A street, South Boston, is in the market for a second-hand 24 x 24 in. planer with 10-ft. bed.

The Traut & Hine Mfg. Company, New Britain, Conn., manufacturer of metal specialties, has increased its capital stock from $200,000 to $500,000. The new securities will be distributed as a stock dividend of 150 per cent.

The Manchester Supply Company, Manchester, N. H., will occupy the building in that city soon to be vacated by the Leighton Machine Company, which is removing to its new shop at East Manchester.

The B. L. Company, Norwich, Conn., manufacturer of ball bearings, has incorporated with a Connecticut charter and capital stock of $50,000, commencing business with $10,000. The company manufacturers all styles of ball bearings products which have previously been imported from Germany. Otto Bruenauer is the president and B. F. Leavitt treasurer and general manager. The New York office is at 50 Church street.

The Symonds Motor Wagon Works has been organized, with a factory at Hyde Park, Mass., to manufacture motor wagons. The company is closely allied with the Exeter Machine Works, Exeter, N. H., of which Joseph H. Symonds, for whom the new company is named, is the president. The new industry will be located in a large building at Hyde Park, formerly used as a woolen mill. A medium price motor wagon will be constructed. Charles C. Leach is the mechanical engineer. A branch metal working plant is planned, to be located in Boston. The Exeter Machine Works is planning to reopen its iron foundry, which has been shut down for some years, and will modernize the equipment for the purpose. New machinery will be installed, replacing some of the older tools in the works. New lines of curved blade and Exeter many blade fans are being designed.

The National Boat & Engine Company has been incorporated under the laws of Maine to take over the business of nine companies which have been engaged in the manufacture of motor boats and parts. Walter J. Reynolds, Muskegon, Mich., is president; J. M. Truscott, St. Joseph, Mich., vice-president, and C. A. Williams, Bay City, Mich., secretary. The authorized capital stock of the company is $10,000,000, and a bond issue is also contemplated. The plants which are merged into the new company are the following: Racine Boat Mfg. Company, Muskegon, Mich.; Truscott Boat Mfg. Company, St. Joseph, Mich.; Pope Boat Company, Fond du Lac, Wis.; Pierce Motor Boat Company, Racine, Wis.; Shell Lake Boat Company, Shell Lake, Wis.; Western Boat & Engine Works, Michigan City, Ind.; West Mystic Mfg. Company, West Mystic, Conn.; Inland Lakes Boat Company, Lake Geneva, Wis. The new company also contemplates engaging in the manufacture of aeroplanes.

The Miner & Peck Mfg. Company, proprietor of the Peck Drop Press Works, New Haven, Conn., is making extensive alterations to its plant and adding to its manufacturing equipment. The company has booked enough business to keep it going until February and its business is rapidly expanding.

## Cleveland

CLEVELAND, OHIO, December 13, 1910.

While not much business is coming out in the shape of actual orders, dealers report a considerably better volume of inquiry than a month ago. Numerous prospective buyers are getting prices on tools that they expect to place orders for soon after the first of the year, so that these inquiries are not stimulating current business very much, but they have made a better feeling among the trade. Business during the week has been largely of a pick-up character, being confined mostly to small and medium sized single tools. Architects and engineers have considerable work on hand in the line of new manufacturing plants and additions, on which construction will be started early in the spring, so that the outlook for a fair demand for machinery equipment from this source is quite promising. The demand for second-hand machinery is fairly good. About a month ago considerable used machinery was thrown on the market, but this supply seems to have been pretty well absorbed and less is being offered at present, the supply not exceeding the demand. Builders of industrial cars and locomotives report that the demand for their products which has been active for some time continues good.

In the foundry trade business continues light, but a few of the foundries report some improvement in inquiries.

For enlarging the municipal water works plant in Canton, Ohio, the Directors of Public Service will receive bids this week for one double acting Triplex power pump with a capacity of 2,000,000 gals. per 24 hours, direct connected to a 150-hp. alternating motor. Bids will also be received for a horizontal centrifugal pump in one or two units for pumping against a head of 250 ft. For power equipment bids will be received for one 250-hp. compound steam engine direct connected to a 150-kva. A. C. generator and exciter with a suitable switchboard, also condenser for engine; also for 325-hp. engine and 200-kva. alternating current generator, and for gas engines and generators of similar capacities. Bids will also be received for a steel storage reservoir of from 1,000,000 to 2,000,000 gal. capacity.

An industrial exposition is being planned in Toledo, Ohio, under the auspices of manufacturers of metal goods. Of the 80 companies in that city engaged in metal working industries 51 have already agreed to take part in the proposed exposition, the date for which has not yet been set. Some of the leading manufacturers in the city are taking an active interest in the project.

The plant of the Gabriel Horn Mfg. Company, East Fortieth street, Cleveland, was totally destroyed by fire December 10, causing a loss of about $50,000. The company manufactures automobile horns. The plant will probably be rebuilt at once.

The Cleveland Engineering Company has completed plans for the new plant to be erected by the Ohio Blower Company, Cleveland, and will receive bids for the buildings December 15. There will be two buildings, one a factory building, 80 x 128 ft. and the other an office building 48 x 51 ft. Both will be two-story structures of steel and mill construction. The plant will be located at Banker avenue and East Sixty-first street. Very little new machinery will be required.

Plans for a new plant to be erected by the Suspension Roller Rearing Company, Sandusky, Ohio, have been completed by the Osborn Engineering Company, Cleveland. The latter company will receive bids for the building December 19. This will be a one-story structure of brick and mill construction, 60 x 320 ft. The roller bearing company will purchase woodworking machinery and brass and iron foundry, forge shop and machine shop equipment.

The Atlas Car & Mfg. Company, Cleveland, reports the receipt recently of a number of good orders for industrial car equipment. Among these orders are the following: Two orders for 50 special 6-yd. cars from Pennsylvania quarries for handling stone direct from steam shovels; two industrial railroads, one for a large manufacturing plant and one for an automobile plant, and two storage battery locomotives for a steel plant.

A deal has been practically concluded in Tiffin, Ohio, for the removal of the plant of the Webster Mfg. Company from Chicago to that city, where it will be united with the plant of the Tiffin Malleable Iron & Chain Company. One of the conditions of the removal, which is understood to have been met, is the sale of $300,000 in bonds. Plans have been made for extensive additions to the Tiffin plant. These additions will provide a floor space of between 110,000 and 120,000 sq. ft. and more than double the capacity of the present plant.

The Wood County Stone Construction Company, Bowling Green, Ohio, has been organized, with a capital stock of $25,000. The company will erect a stone crushing plant.

# THE MACHINERY MARKETS

John H. Lincoln is president and Dr. F. D. Halleck secretary and treasurer.

The Goodyear Tire & Rubber Company, Akron, Ohio, is completing additions to its plant, which will be ready for occupancy by January 1. These consist of a factory building 400 ft. long, five stories and basement, and a large power house.

The Dover Mfg. Company, Canal Dover, Ohio, has increased its capital stock from $100,000 to $150,000.

The Norwalk Drilling Tool Company, Norwalk, Ohio, incorporated with $10,000 capital stock, will manufacture all kinds of drilling tools, steel forgings, rough or machined, and make a specialty of repair work, of gas and steam engines and pumps. The company has purchased the buildings of another concern, especially adapted for its requirements, and which contains a complete equipment, consisting of hammers and machine tools.

## Cincinnati

CINCINNATI, OHIO, December 13, 1910.

The export business is engaging the attention of the machine tool trade here, and quite a number of firms report orders received lately from different parts of the world. While orders from the domestic trade are slow in coming in to some firms, others state that the week opened up very favorably, and show the documents to back up this claim. The South has lately furnished a fair share of orders for machine tools, and some of the railroads in that part of the country are said to have been better customers within the past six weeks than some of the larger systems in the North and West. However, the bulk of business received continues to come from the general trade all over the country.

Second-hand machinery shows some improvement, but this is considered merely a temporary spurt, and no steady gain is anticipated until after the holiday season.

The Industrial Bureau of Cincinnati has under consideration an offer from an automobile manufacturing firm to establish a plant in Cincinnati, and it is expected that a favorable location will be found within the next few days. A shoe manufacturer is also contemplating moving his plant to this city some time during the spring.

The Cincinnati Branch, National Metal Trades Association, gave a banquet at the Business Men's Club December 8, at which were present a large number of manufacturers and railroad men. R. K. LeBlond, president of the R. K. LeBlond Machine Tool Company, was toastmaster. A. H. Lazare, central Western manager of *The Iron Age*, substituting for Wm. H. Taylor, general manager of the David Williams Company, who was absent on account of illness, delivered an interesting address on the subject of "Industrial Peace." William Hodgon, freight traffic manager of the Pennsylvania lines at Pittsburgh, presented an able argument on advancing freight rates and he was well supported later by D. C. Buell of the Union Pacific Railway System. Other railroad speakers included S. C. Matthews, general freight agent of the Pennsylvania lines, and Superintendent R. C. Barnard of the same company. Murray Shipley of the Lodge & Shipley Machine Tool Company, responded with an urgent appeal for a square deal for the railroads, followed by Philip Geier of the Cincinnati Milling Machine Company, J. C. Hobart of the Triumph Electric Company, and W. Copley of the Lima Locomotive & Machine Company. Prof. Frank H. Ball called attention to the manual training department of the Cincinnati Public Schools. Assistant Secretary Manley of the Metal Trades Association, who arranged the banquet, responded to the addresses and was vigorously applauded.

The J. B. Morris Machine Tool Company, Cincinnati, expects to have its new shops in operation before January 1.

The Bradford Machine Tool Company, Cincinnati, has acquired a tract of land adjoining its plant, which will be used for yard storage purposes.

The Cincinnati Planer Company's Oakley plant is working on full time, and lately orders have been received from Holland, Belgium, Germany, Italy, Japan and Cuba, which goes to show that the export business is improving. The company's domestic orders have also been on the increase lately, and an excellent spring business is anticipated.

The Business Men's Club, Cincinnati, gave a dinner to Charles H. Sherrill, United States Minister to Argentina, who delivered an address on South American trade that was very interesting to the manufacturers, especially the machine tool builders, who were present.

It is stated on good authority that the improvements contemplated to be made at Oakdale, Tenn., by the Queen & Crescent Railroad Company, will be carried out and that considerable shop machinery will be required by that company next year.

The Athens Heat, Light & Power Company has been incorporated at Athens, Ohio, with $25,000 capital stock, by F. T. Lindman, C. S. Blauvert, W. E. Detlor, B. F. Detlor and Peter Kunz.

The Igou Mfg. Company has been incorporated at Springfield, Ohio, with $100,000 capital stock, to manufacture and sell machinery. The incorporators are Dennis T. Igou, P. A. Staley, D. C. Igou, D. E. Jones, R. H. Foos and J. H. Dyer.

To mine coal and manufacture coke, the Orr Coal Mining Company has been incorporated at Grafton, W. Va., by J. M. Orr, C. N. Orr, N. F. Orr and A. W. Burdette, all of Grafton, and C. B. Johnson of Clarksburg, W. Va.

The Hoovan, Owen & Rentschler Company, Hamilton, Ohio, has added to its line of manufacture sugar machinery, and has recently made shipment of two large outfits to Porto Rico and one to a Texas crusher. Its new pattern shop has been completed and other additions are contemplated for the spring.

The four-story addition to the Black & Clawson Company's plant, at Hamilton, Ohio, has been completed, and is now used as a pattern shop and storage department entirely.

The Hamilton Machine Tool Company, Hamilton, Ohio, reports some recent sales of lathes for shipment to Japan, Norway and Holland.

The H. P. Deuscher Company, Hamilton, Ohio, manufacturer of woodworking machinery, whose plant was recently mentioned as being damaged by fire, is adding to its foundry building a one-story, 80 x 140 ft., brick structure, which will give its foundry a total length of 340 ft. The shop building, also under construction, measures 60 x 190 ft. Several outside storage buildings are being erected, and the company expects to have all completed by early spring.

Schenck & Williams, Dayton, Ohio, are drawing up plans for a $100,000 power building, to be erected for F. P. Beaver, Dayton, and work is expected to commence early in the spring.

The Buckeye Stamping Company's factory at Columbus, Ohio, recently mentioned, is nearing completion and will be occupied at an early date.

The Philip Carey Mfg. Company's Lockland plant is running up to capacity, and an especially heavy demand for insulating material is reported at the present time.

The Long & Allstatter Company, Hamilton, Ohio, has recently shipped five of its large punching and notching machines to the Edgar Thomson Works of the Carnegie Steel Company.

The Troy Foundry Company, Troy, Ohio, recently incorporated with $10,000, has secured the building and equipment of the old Troy Foundry & Machine Company. The company will make all kinds of gray iron castings and has a capacity of 20 to 25 tons a day.

## Pittsburgh

PITTSBURGH, PA., December 13, 1910.

There is not very much life to the market at present, so far as the immediate requirements of this district are concerned. Local concerns are looking mainly to other parts of the country for orders, the aggregate of which continues fairly large.

The United States Signal Company has been organized at Pittsburgh by Thos. A. McQuaide and others. Its plans include the establishing of a factory for the manufacture of boxes and other apparatus for police and fire alarm systems.

The selection of the site for a refinery to be located near Butler, Pa., is under consideration by officials of the High Grade Oil Refining Company, Pittsburgh. J. A. Schofield is president.

Contracts are to be let shortly for a plant to be built by the Bluefields Gas & Fuel Company, Bluefields, W. Va., which will triple its present generating capacity. The plant will include a steam boiler, two benches and the necessary retorts.

The Penn Central Light & Power Company will begin the erection, by or before spring, of a large electric generating station at Altoona, Pa.

Construction contracts have been awarded for a new electric traction line, to be known as the Allegheny & Northwestern Railway, Butler, Pa., which will build from Evans City to Harmarville. The plans for power equipment have not yet been settled upon.

The sale of machinery in and around Charleroi, Pa., should be influenced considerably by a campaign which has just been inaugurated by the Charleroi Business Men's Association of that place for the location in that district of new industrial plants.

Among the contracts recently booked by the Westinghouse Electric & Mfg. Company, Pittsburgh, is one for steam turbines and generators, comprising three units, for the new central power station of the electrical pumping system at Buffalo, N. Y.

# THE MACHINERY MARKETS

Very comprehensive plans for a large electric generating plant at Speers, Pa., are reported to have been prepared by the West Penn Railways, Pittsburgh, but for the present the additional power needed will be provided by doubling the capacity of its Connellsville station, where extensive improvements are now in progress.

Electric drive is to be installed throughout in the plant of the Union Clay Mfg. Company, Empire, Ohio.

A steam turbine power plant of 500 kw., with three water tube boilers, condensers, feed water and circulating pumps, &c., as well as auxiliary electrical machinery, will be provided for by the Clarion & East Brady Electric Railway Company, Clarion, Pa.

New machinery is being installed by the Parkersburg Mill Company, Parkersburg, W. Va., which will materially enlarge the capacity of its timber cutting and woodworking plant. All of the equipment is to be electrically operated and controlled.

The Pittsburgh Meter Company, East Pittsburgh, Pa., has plans under way for some large additions to its plant, full details of which have not as yet been worked out.

## Milwaukee

MILWAUKEE, WIS., December 12, 1910.

The local machinery trade is irregular, and conditions lately have been far from satisfactory, although in some lines manufacturers are working nearly or quite to capacity. Price cutting has again developed, particularly with reference to electrical machinery, and intending purchasers are playing off one concern against another.

For heavy machinery, such as only a few of the larger plants build, the demand appears to be improving. Some excellent orders have been entered here within the past fortnight, and enough others are practically certain of being closed to insure a good run of work in the shops. Drafting and estimating departments are busy. Within a few weeks, at least, the patternmaking and foundry departments will have considerably more to do than was the rule during the fall, and, from present indications, the machine shops in which work is now slack will be well occupied by the middle of January.

The C. Reiss Coal Company, Sheboygan, Wis., will have plans completed shortly for a new power plant and coal dock at Manitowoc, Wis. Boilers, engine, generator, electric motors and handling machinery will be among the requirements.

The foundry building which was to have been erected this fall by the Porcelain Enameling Association of America, at Sheboygan, Wis., will not be started until spring.

The Smalley Mfg. Company, Manitowoc, Wis., has purchased some of the machinery for the addition to its plant but will require more later on, when the new quarters are occupied.

William Gateman, Manitowoc, Wis., will install a machine shop for repair work in connection with a garage which he is about to build there.

The Westinghouse Electric & Mfg. Company, through its district office in the Majestic Building, Milwaukee, has taken the contract for the electric motors to be installed in the new factory of the S. W. Miller Piano Company, Sheboygan, Wis.

The Standard Zinc Company, Platteville, Wis., will dispose of considerable pumping, hoisting and other machinery which has been displaced by heavier equipment.

The Menominee & Marinette Light & Power Company, Menominee, Mich., is arranging to extend its service to a number of industries in that vicinity, which will put in motor drive, including plants located on the island between the two cities.

The plant of the French Battery Company, at Madison, Wis., recently burned, will be rebuilt.

The city of Stoughton, Wis., has bought the water power of the Stoughton Milling Company, which will be utilized as an auxiliary to the municipal plant now operated, after being improved.

It is reported from Chippewa Falls, Wis., that a new timber cutting plant will be built there, and equipped for electric drive by Johnson & Lee.

The works of the Power & Mining Machinery Company, Cudahy, Wis., are exceptionally active, and every indication points to the fact that they will soon be running practically to capacity. The business shows considerable improvement over last year.

The Milwaukee Bridge Company, Milwaukee, has the contract for the structural work on a new manufacturing plant for the J. W. Wells Company, Menominee, Mich.

The concentrator and power plant of the Minnie Mining Company, Benton, Wis., is to be rebuilt, having been almost completely destroyed by fire.

The Sternberg Mfg. Company, Milwaukee, which recently completed an auto-truck factory in West Allis, will probably enlarge the plant by or before spring, in order to meet the demand for its product.

The Giddings & Lewis Mfg. Company, Fond du Lac, Wis., has taken the contract for the complete equipment of a timber cutting plant, the main building of which will be 65 x 210 ft., that has been designed for erection by the Finger Lumber Company, Ltd., in Saskatchewan. Members of the Menasha Woodenware Company, Menasha, Wis., together with Herman Finger of Port Arthur, Ont., form the new organization.

A car house, which will probably be equipped with tools for repair work, is to be built in Janesville, Wis., by the Janesville Traction Company.

A new boiler plant will need to be erected by the Shawano Lumber Company, Shawano, Wis., to replace the one operated in connection with its mill, which recently burned.

The Battery Light & Power Company, recently organized in Milwaukee, has secured manufacturing facilities and is extending its sales campaign over the State. H. M. Klingenfeld is manager.

The McDonough Mfg. Company, Eau Claire, Wis., recently completed the installation of new machinery in the remodeled mill of the Conway Lumber Company, Conway, N. H., which is a steel frame structure, 75 x 300 ft., of the most modern design and equipment.

The Gardner Machine Company, Beloit, Wis., advises that it will have the machine shop department of its new plant in operation in about three weeks.

## Detroit

DETROIT, MICH., December 13, 1910.

The automobile industry exhibits increased strength. Reports received by the leading companies from their agencies in various parts of the United States, as well as some foreign countries, are most encouraging. Great interest is being taken in the new models, and for high grade machines, at least, the demand next year will unquestionably be heavy. This condition has, of course, its due effect upon the purchases made by the motor car builders. They are buying steadily to meet regular operating needs, and, while the tendency still is not to order tools or supplies very far ahead of actual requirements, a favorable price will frequently lead to very satisfactory bookings.

The gasoline engine department of the Port Huron Construction Company, Port Huron, Mich., is crowded with work at present. It has been found necessary to put on more men for assembling and testing.

The plans of the Huron Mfg. Company for a factory in Ann Arbor, Mich., are practically complete, and construction contracts have been let. Some of the details of equipment are, however, still to be worked out.

A branch plant, 30 x 130 ft., is to be built in Detroit by the Dominion Stamping Company, Walkerville, Ont.

The National Cable & Mfg. Company, Niles, Mich., which recently increased its capital stock from $40,000 to $100,000, has bought the factory and other property of the Eager Mfg. Company of that city, which will be used for the extension of its business.

The Gaylord Motor Company at Gaylord, near Boyne, Mich., is preparing to manufacture its own automobile bodies.

The J. E. Bolles Iron Works, Detroit, have been awarded the contract for a three-story addition to the plant of the Detroit Forging Company.

From Eaton Rapids, Mich., it is reported that J. Lamb has organized a company to establish a plant for the manufacture of agricultural machinery.

The Detroit Bridge & Steel Works, Detroit, will erect the new municipal boiler plant, plans for which were recently approved by the Public Lighting Commission of Detroit.

D. W. Moseley, Alba, Mich., will put in a new timber cutting plant near that place.

A new two-story factory building is to be erected by the American Agricultural Chemical Company, Detroit. Plans are now being drawn.

The Consumers Power Company has been organized at Manistee, Mich., to build an electric plant furnishing current for industrial purposes. Its full plans, however, have not been made public.

Advices from Midland, Mich., are to the effect that a planing mill will be completed there this winter by John Nehil & Son.

The Bucyrus Foundry & Machine Company, Bucyrus, Ohio, is preparing to erect a shop building of brick and steel construction, which will be furnished with modern equipment.

Bids for a filtration plant and its complete equipment

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will be taken up to January 19 by the city of Grand Rapids, Mich.

The Inner-Brace Chair Company, Schoolcraft, Mich., recently incorporated with $100,000 capital stock, has acquired about 2 acres of ground improved with a two-story building, 40 x 140 ft., on which it is making extensive repairs preparatory to the manufacture of dining room chairs reinforced by invisible continuous steel bracing. The company has already purchased all necessary equipment, but will be in the market for a considerable amount of hand tools.

## Toronto

TORONTO, December 10, 1910.

As the time of year for stock-taking and slowing down for repairs draws near, business begins to fall away somewhat from the high line that marked its movement throughout the autumn. But its energy is not greatly lowered; it is still in a condition that can be described as active. That the accumulation of unfilled orders is being eaten into at a rate more rapid than that of its accretion is, however, probably a fact. It remains to be seen whether steam can be kept up at the present pressure throughout the winter. There is a large amount of capital in hand yet to be expended on new enterprises, expansive and reconstructive—capital brought into the country as the proceeds of securities that have been taken freely abroad, mainly in England, and to a limited extent in France. Other issues whose total amount will be great are expected to be forthcoming. It does not appear that there will be a want of funds for the purchase of plant and equipment on these accounts, whether or not the buying power derived from the last crop will continue to play so large a part as it has done so far.

At a meeting held in Welland, Ont., this week it was decided by the directors of the Niagara Falls, Dunnville, and Welland Electric Railway Company to expend $1,000,000 on railroad construction account. Car barns and machine shops are to be erected in Welland.

The Vancouver Gas Company is preparing to build a new plant on deep water frontage at Vancouver, B. C.

The Canadian Auto Top Company, to manufacture tops, wind shields and other accessories of automobiles, expects to have its plant at Tilbury, Ont., ready for operation by January 1. Among the provisional directors are persons said to be connected with the American Auto Top Company, Jackson, Mich.

M. W. Doherty, recently connected with a machinery company in Galt, Ont., is organizing a company to manufacture machinery in St. John, N. B. Incorporation is being sought, the capital stock to be $99,000, and some Toronto machinery interests are named in connection with the enterprise. Woodworking, sawmill and machineshop supplies will be carried in stock.

It has been announced by the chairman of the Ontario Hydro-Electric Commission that the machine shops of the commission will be located in London, Ont., that being the central point in the transmission system.

A proposal to establish in St. Thomas, Ont., an industry to employ 200 hands is being considered by the City Council. A fixed assessment for a number of years is asked for. Machinery is to be put in on a considerable scale, but no further particulars are given out. Negotiations are on foot for the placing in the city of a branch of an American manufacturing concern. Fifty hands would be employed. Some municipal assistance is asked. Of the nature of the works nothing has yet been made public.

A large American concern is in communication with the president of the Board of Trade in London, Ont., in respect to the establishing of a Canadian manufacturing branch there.

The Doty Engine Works Company, Goderich, Ont., proposes to establish a shipbuilding yard at Port Stanley, Ont. Large tugs will be built. The company has contracts for three large ones at present.

The ratepayers of London, Ont., are about to vote on a by-law for fixing the assessment of the McClary Mfg. Company at $150,000, which is $50,000 higher than the amount at which it was fixed in 1902. It is proposed to make large additions to the works in the next few years.

Winnipeg is making special efforts to secure manufacturing businesses and several manufacturers in eastern Canada are considering the placing of branch works there, where cheap hydro-electric power is now obtainable.

The Paterson Lumber Company proposes to build manufacturing works to cost $250,000 to $300,000 in Vancouver, B. C., in connection with its existing business there.

The Richardson Feldspar Mfg. Company, Kingston, Ont., has entered into a contract to supply two carloads of feldspar per week to a soap-making concern in the United States. This is a consequence of Germany's action to restrict the exportation of potash, the concern in question having discovered a process for profitably extracting potash from the feldspar ore of Kingston vicinity.

The Ontario government has passed an order-in-Council providing for the building of a branch line from its Temiskaming & Northern Ontario Railway into the Porcupine mining district. This 32 miles of road will cost about $400,000 and is to be built without delay. Its construction is certain to cause a large expansion in the demand for machinery for mining operations in that camp, whose properties specially require heavy machinery, which cannot be brought over the sleigh roads except under great difficulty and almost prohibitive cost.

Port Arthur (Ont.) municipal authorities have now under consideration proposals for the establishing of new industries involving a capital outlay of $1,400,000. H. S. Jones of Winnipeg proposes to build and operate car works. The plant is to cost $400,000. A free site of 15 acres is asked. A prominent American manufacturer is asking consideration for a project to put up automobile works there to cost $500,000. A foundry project in connection with the local blast furnace is also the subject of negotiation. Mr. Jones' plant would include in its output and operations machinery, cars, railway equipment and repairs.

The Electric Power Company, Limited, is the name of a corporation that has got control of several operating power companies in the Trent River district, Ont., and is proposing large extensions into the cities and towns of that extensive and busy region.

At a meeting of the shareholders of the Lilliker Car Company, held in Halifax, N. S., on December 6, it was decided to accept the amended offer of F. B. McCurdy to purchase the assets and business. The offer includes an undertaking to put $600,000 new capital in the business. The McCurdy interests will purchase $600,000 of the first preferred 7 per cent. stock.

The Collingwood Shipbuilding Company, Collingwood, Ont., has obtained the contract to build a passenger steamship for the Niagara, St. Catharines & Toronto Steamship Company for $165,000; also one for the Ontario & Quebec Navigation Company to cost $250,000; and will make important alterations in two of the steamships of the Canadian Pacific Railway lake line.

The Humber Lumber and Pulp Company is preparing to add to its works a very large pulp mill at Bay of Islands, Newfoundland.

The Grand Falls Company, Limited, which has been formed with $1,200,000 capital stock to develop power and construct large pulp and paper mills at Grand Falls, N. B., is a corporation of men of financial strength, including as it does Sir William Van Horne, ex-president of the Canadian Pacific Railway Company; W. S. Holt, president of the Royal Bank of Canada; George F. Underwood, vice-president of the International Paper Company.

A branch of the Massey-Morris Company's business is to be established in Edmonton, Alberta.

The Rat Portage Lumber Company's mill on the St. Boniface side of the Red River, opposite Winnipeg, Man., was burned on December 7. Loss estimated at $200,000, of which about 80 per cent. was covered by insurance.

In the spring the Diamond Flint Glass Company will erect a large glass factory on a 10-acre site obtained for it in Hamilton by the Publicity Commissioner there. When the new factory is completed the company will vacate its present premises in the city. It is also announced by the commissioner that the Egg-O Baking Powder Company of Repira, Sask., will establish works in Hamilton, and that the Robinson Box Mfg. Company of Lowell, Mass., will do so as well. He says that new factories of an aggregate value of $4,000,000 have been secured for Hamilton within the last twelvemonth.

The Central Canada Power Company, capital stock $10,000,000, has been incorporated under Dominion laws. It will carry on business from its head office in Toronto.

Incorporation has been granted to the Dominion Carlite Explosive Company with head office at Wallaceburg, Ont., and a capital stock of $100,000.

## Texas

AUSTIN, TEXAS, December 9, 1910.

The effect of the severe drouth that has prevailed in some parts of Texas for several months is beginning to be felt by business interests. While there has as yet been no appreciable curtailment of industrial operations and plans in any line, such a result is expected, unless rains come in time to insure good crops for next year. Winter rains are the chief dependence of Texas farmers who are situated out of the irrigated parts of the state. In south Texas, where there has been such wonderful irrigation develop-

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ment during the last few years, the lack of natural rainfall is not of serious moment to the farmers. No diminishing of the flow of water in the different streams or of the artesian supply available for irrigating the lands is imminent. The drouth in other parts of the state is serving to make more apparent the benefits and advantages of growing crops by means of irrigation, and the increased sales of pumping machinery demonstrate the interest that is being taken in that branch of the agricultural industry.

C. B. Atterbury, Hillsboro, Ill., has under consideration the establishment of a factory in Austin for the manufacture of a certain line of farm machinery.

The plant and other holdings of the Taylor Water Company at Taylor, Texas, have been purchased by Andrew J. Zilker of Austin. He will make improvements to the property.

The Houston Land Corporation, which is arranging to lay out a new suburban town on the outskirts of Houston, will equip the place with water mains and a sewer system. The tract that is to be developed embraces 160 acres.

The Southern Marble & Stone Company will install a stone cutting plant at Yoakum, Texas. J. Lyons is president.

The boards of County Commissioners of Coleman and McCulloch counties have agreed to jointly erect two steel bridges across the Colorado River; one at or near Waldrip will cost $15,896, and the other at Stacy, $21,484.

Tennission Brothers have established a factory at Houston for the manufacture of metal shingles, metal feed troughs and water troughs. They have a similar factory at Texarkana, Texas.

The Progressive League of Goliad, Texas, is arranging to offer inducements for the establishment at that place of a canning factory, broom factory and steam laundry.

It is announced by the Hubbard Mfg. Company that its hoop mill at Texarkana, Texas, which was recently destroyed by fire, will be immediately rebuilt.

The City Council of Brownsville, Texas, recently received the proceeds from the sale of $30,000 of bonds to be used in enlarging the electric light plant and water works system.

The Electric Railway Company of El Paso has under consideration the construction of an electric transmission line down the Valley of the Rio Grande to supply power for the operation of irrigation pumping plants of farmers of that section.

The large holdings of S. A. Robertson and Alba Heywood of San Benito, Texas, in the Brownsville Irrigation Company of Brownsville, have been purchased by A. W. Gardner & Co. of Houston. The company, it is reported, will now make extensions and improvements.

The Gulf, Colorado & Santa Fe Railroad will erect a brick machine shop and an addition to the 10-stall roundhouse at Somerville, Texas. New equipment will be installed in the machine shop building when it is finished. The general offices of the railroad are at Galveston.

The city of Pecos, Texas, has voted $25,000 of bonds for the construction of a sewerage system and disposal plant. The plans of the O'Neill Engineering Company of Dallas for the proposed improvement have been adopted by the City Council.

At a recent meeting of the city commission and business men of Port Lavaca, Texas, a committee of five men, headed by C. J. Spittal, was appointed to investigate the situation in regard to the construction of a modern and complete system of water works for the town. An effort will be made to enlist private capital in the project.

It is announced that the hydroelectric plant, which the Gila River Power Company will install on the Gila River in Grant county, N. M., will be of 15,000-hp. capacity.

The taxpayers of Menard county, Texas, will vote February 7 on the proposition of issuing $20,000 bonds to erect a steel bridge across the San Sabe River at Menard.

In return for a bonus of $50,000 donated by the people of Beeville, Texas, the Nueces Valley Railroad Company agrees to locate its shops at that place. The contract for the construction of the first 60 miles of road was recently let. The new line will run from Beeville to Eagle Pass or some other point on the Rio Grande.

S. H. Mitchell and associates will construct an interurban electric railway between Phoenix, Ariz., and Glendale. The survey has been made and the right of way obtained.

The Cotton Land & Water Company of Kingman, Ariz., is preparing to enlarge its system of irrigation with the view of bringing under cultivation 50,000 acres of land situated in the valley of the Colorado River.

The installation of a hydroelectric plant, to cost about $326,000 and to be operated in connection with the Elephant Butte government land reclamation project in the upper valley of the Rio Grande, is in contemplation by the Water Users' Association, El Paso, which is composed of the land owners embraced in the irrigation enterprise. This power will be used chiefly to operate the auxiliary pumping plants of the farmers of the valley, it is stated.

A. W. McPherson of Santa Monica, Cal., who was recently appointed receiver of the Bisbee Light & Power Company, Bisbee, Ariz., which operates the gas plant at the latter place, announces that he will lay new mains and extend the system.

L. F. Bennett and George P. Baker of Oklahoma City, Okla., will erect a large factory for the manufacture of crates and boxes at some point in the vegetable and fruit growing region of northeastern Mexico.

J. H. Politzer, special representative of the United States Steel Products Company, who recently made a trip through the west coast region of Mexico, says that he found trade conditions excellent everywhere he visited. The demand for machinery of various kinds is constantly increasing.

The Powell pumping station of the municipal water works system of Fort Worth was completely destroyed by fire December 8. The loss to machinery and building was about $10,000, covered by insurance. The plant will be rebuilt as quickly as possible.

Charles J. Johnson of the Palacios Machine Shops & Garage, Palacios, Texas, is installing equipment in a machine shop at the Markham oil field and desires quotations on the following equipment: One 16-in. by 10-ft. lathe, one 20-in. by 16-ft. lathe with taper attachment, one 20 or 21 in. upright drill press, one sliding head back geared drill press from 26 to 30 in., one 21 or 24 in. geared crank shaper, one pipe threading machine to take work up to 8 in., one bolt and nut drilling machine to handle work up to 1½ in., one grinder, one 100-lb. power hammer, a line of blacksmithing equipment, &c.

The construction of a municipal incineration plant is under consideration at Temple, Texas.

The plant of the Georgetown Water, Electric & Power Company, Georgetown, Texas, will be taken over by the city and its equipment enlarged.

E. M. Paulk and others of Royse, Texas, have organized the City Mill & Light Company. Electrical machinery will be required.

The San Antonio Machine & Supply Company, San Antonio, Texas, has received, among recent orders, the contract for the pumping machinery to be installed in the plant of the Brownsville Sewerage Company, Brownsville, Texas.

The contract for a pumping plant, elevated steel tank and water distribution system will be let in the near future by Rogers, Texas.

It is proposed at Beaumont, Texas, to authorize the expenditure of $300,000 for water works construction, including the installation of modern high duty pumping machinery.

The Lufkin Foundry & Machine Company, Lufkin, Texas, is furnishing a new band mill equipment for the plant of the Palmetto Lumber Company, at Oakhurst, Texas.

## The Northwest

MINNEAPOLIS, MINN., December 12, 1910.

Last month was in general a very profitable one for the various engineering and equipment houses of this section, and the opening weeks of December have carried with them a fair run of contracts, many of which are not to be completed until the later part of spring or early summer. The designing and installation of electric power and pumping plants, as well as other works of a public or quasi-public nature, are prominent in recent bookings. In machinery and supplies used for factory, mill, shop or foundry purposes trade remains rather quiet, although reasonably good for the pre-holiday season.

An electric plant to serve the community may be erected at Egan, S. D.

A hydroelectric power plant is being constructed at Pine River, Minn., by Webber & Hill. All of the machinery and other equipment will be furnished by the Power Engineering Company, Minneapolis.

Bids will be taken until December 22 by the city of Calgary, Ont., on a synchronous motor-generator set of 1500 hp., together with exciter unit, switchboard, &c.

Under the terms of a franchise recently granted by Eureka, S. D., a central power and lighting plant will be built here by G. A. McLaughlin, whose address is given as Aberdeen, S. D.

A new company which will enter the machinery field here is stated to be the Northwestern Electric Equipment Company, represented by F. B. Thompson, St. Paul, which was recently incorporated for $600,000.

Work, which includes the building of a dam, will begin in the spring on a hydroelectric plant, to be constructed by

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the city of Thief River Falls, Minn. It will, however, be some time until the machinery needs to be purchased.

A new municipal pumping plant, steel tower, tank and concrete reservoir are to be constructed for water works service at Huron, S. D.

Geo. R. Griffith, Pipestone, Minn., will install several electric power and lighting plants in that vicinity under the terms of franchises recently granted him.

A company has been organized by T. J. Wixon, Highmore, S. D., to install an electric power and lighting plant.

The installation of additional pumping units in the several water works stations at Duluth, Minn., is under consideration there by the Board of Water and Light Commissioners, who have made specific recommendations on the subject to the Common Council. A bond issue of $300,000 will be required to defray the cost.

An addition is to be made to the plant of the National Woodenware Company, Hill City, Minn., and some new machinery provided.

Wm. Dollar, president of the Exchange National Bank, Coeur d'Alene, Idaho, is interested in a company being formed to establish an electric power and lighting plant, utilizing as fuel the refuse from the mill of the Stack-Gibbs Company.

Considerable new woodworking machinery will be provided by the O'Neil Lumber Company for an addition to its plant at Kalispell, Mont., which is now under erection.

A new pumping plant for municipal service was recently put in operation at Eureka, Mont., and other public improvements are to be made in the spring.

Within the next few months additional machinery will be installed in the plant of the Eureka Lumber Company, Eureka, Mont., and other changes effected, making it one of the best equipped of its kind in the Northwest.

It is reported that Mankato, Mich., will expend $20,000 for improvements to its water works system.

The electric light plant at Long Prairie, Minn., recently damaged by an explosion, will probably be replaced by the installation of a new plant.

The Board of Water and Light Commission of Duluth, Minn., has asked for a $300,000 bond issue, with a view to installing pumping equipment, building a new reservoir and replacing some pumping apparatus now in use.

## The South

ATLANTA, GA., December 12, 1910.

There does not appear to be much new business in sight at present, except as routine buying for manufacturing industries may require, nor is there likely to be any great degree of activity until the holidays are over. A goodly number of contracts long pending have, however, been closed recently by machinery houses in this section, including the representatives of Northern builders located in the larger trade centers, such as Atlanta, Birmingham and New Orleans, and with reference to the future a decidedly optimistic feeling prevails.

It is probable that a motor driven centrifugal pump will be added to the equipment of the municipal water works station at Troy, Ala., its installation having been recommended by the superintendent in charge. Improvements in the lighting plant are also contemplated.

Plans for the enlargement of its car shops at Gadsden, Ala., and the installation of considerable new machinery are being made by the Alabama Great Southern Railroad Company.

It is probable that the woodworking plant of the Sumter Company, Livingstone, Ala., which was destroyed by fire, will be rebuilt for larger capacity.

Geo. Makely, Swanquarter, N. C., is chairman of a commission which has in charge a large reclamation project in the vicinity of that place. The estimate of the pumping equipment and other machinery required includes three 20-in. centrifugal units, which will probably be steam engine driven.

The Strasburg Light & Mfg. Power Company, Strasburg, Va., will build a large electric plant, taking its power from the Shenandoah River, with the object of furnishing current for lighting and industrial service. The company was recently incorporated.

W. C. Chandler, Coaling, Ala., has organized a company to establish a stave factory at Ashville, Ala.

Through the efforts of the Brunswick Advancement Association a large box factory is to be built at Brunswick, Ga., by the Georgia Veneer & Fruit Packing Box Company.

The Magnolia Furniture Company has been organized at Magnolia, N. C., by J. C. Horne and others, to establish a manufacturing plant.

It is proposed that the electric lighting plant at Bessemer, Ala., be acquired by the city and enlarged, but no definite action to that end has as yet been decided upon.

If a franchise is granted by the local authorities, as expected, W. S. F. Tatum will install an electric power and lighting plant at Hattiesburg, Miss.

The city of Warrenton, N. C., is considering the construction of an electric power and lighting station. An engineer has been retained to prepare plans.

A box factory is to be built shortly at Brunswick, Ga., by R. L. Crandall and C. W. Church.

The plant of the Southern Shovel Mfg. Company, Gadsden, Ala., is being enlarged and improved, with a view to operations on a more extensive scale in future.

Negotiations are now in progress at Vicksburg, Miss., for the purchase by the city of the local water works system. If this is consummated the pumping plant will be enlarged and other improvements made.

One of the most important developments in this section from the standpoint of future requirements of equipment, both for traction and industrial service, is the incorporation of the Georgia & Carolina Railway, to complete an electric line from Augusta, Ga., to Spartanburg, S. C., a distance of nearly 125 miles. A. E. Padgett, Edgefield, S. C., is secretary of the company.

Plans for the building of a factory at Palatka, Fla., which will probably be equipped with electric power, are being carried into effect by the Florida Woodenware Company.

A new plant, in which the machinery will be driven by electric motors, is to be built at Lenoir, N. C., by the Lenoir Chair Company.

The improvement of the water supply system, with consequent need, later on, of new machinery and other equipment, is under consideration at Huntsville, Ala.

A steam power plant of 2000 kw. will be erected by the Augusta-Aiken Railway & Electric Company, Augusta, Ga., as an auxiliary to its present system. The machinery, except for some minor details, is reported to have been already decided upon.

C. B. Rucker, Charlotte, N. C., is in charge of plans for a municipal power plant at Rock Hill, S. C., to supply current to the lighting system.

The Weaks Supply Company, Monroe, La., has taken over the business of J. G. Sanders and assumed possession of the latter's machine shop and foundry. The combined business of the two concerns will be operated under the name of the Weaks Iron Works & Supply Company. The foundry and machine shop will be moved to property heretofore owned by the supply company, and the plant will be enlarged so as to take care of heavy locomotive repair work, &c.

The Georgia Metal Roof Company has been incorporated to manufacture lock metal shingles in a plant at 291 Marietta street, Atlanta, Ga. The company has purchased all the necessary equipment.

A large erecting shed is being built at the Gadsden Car Works, Gadsden, Ala. This plant is owned by the Queen & Crescent Railroad system.

## North Pacific Coast

SEATTLE, WASH., December 9, 1910.

The noteworthy feature of the trade of large machinery houses and metal-working plants on the north coast continues to be its diversity. Orders recently taken have been very fairly representative of all industries, and the buying covers a wide range of equipment, material and miscellaneous supplies for manufacturers, mill owners, contractors, mining companies and lumbermen.

Plans have been agreed upon at Harmony, Wash., for a municipal electric plant, work on which will be started this winter.

A new mill equipped with the Casey-Hedges Company's boilers, steam turbine units of the General Electric Company's design, and about 170 motors still to be purchased, together with operating machinery of proven efficiency, will be put in operation before spring by the O'Connell Lumber Company of Winlock and Seattle, Wash.

The Kilbourne & Clark Company, Seattle, Wash., is making a specialty of designing and installing complete power, lighting and pumping plants for service of every description. It has had a particularly good run of business this year from the mining and lumber companies of the interior.

The authorities at Silverton, Ore., are considering plans for the construction of a water supply system, which will, however, be operated partly by gravity.

Theodore B. Wilcox, president of the Oregon Development Company, in an address at Salem, Ore., made a statement which is attracting considerable attention in machinery circles, to the effect that the Hill lines have decided upon extensive railroad building in Oregon during the next five years. If this is correct, it will mean corresponding activity in furnishing equipment, not only for the roads themselves and the contractors engaged in construction

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work, but also because of the communities and industrial operations that will spring up along the new lines.

A new system of pneumatic operation for trimmers, including an air compressor of the Westinghouse Electric & Mfg. Company's design, is being installed by the Yeomans Lumber Company at its mill in Pe Ell, Wash., which was recently rebuilt.

Additional funds for heavy development work are being provided by the Red Boy Mines Company, Sumpter, Ore., which will be in the market during the winter for considerable machinery and other equipment.

A machine shop equipped for the most complete service, including heavy repair work, has just been finished and put in operation by the McCormick Lumber Company at McCormick, near Centralia, Wash.

The large hydro-electric plant of the Hanford Irrigation & Power Company, Priest Rapids, Ida., which is now under the control of the Pacific Light & Power Company, will be furnished with additional equipment and the service system extended.

The Gilbert Hunt Company, Walla Walla, Wash., has taken over the property of the Gilbert Hunt Mfg. Company of that city and will issue $150,000 worth of bonds, the proceeds of which will be used for increasing its manufacturing facilities. Additional land has been purchased in the vicinity of the company's plant and several new buildings will be erected. The company fabricates steel for bridges and builds threshing machinery. Active building operation, however, will not be commenced until spring.

## Farther Central West

OMAHA, NEB., December 12, 1910.

The preponderance of buying at present is for the account of power and mining properties in the mountain States, where preparations for extensive development work to be carried on during the late winter and spring, especially when open weather again sets in, are now in progress. Air compressors, drills and hoists, with, in many cases, gasoline engines or electric motors to drive them, are most largely in demand. The heavier equipment for steam or hydroelectric power plants has already been decided upon for the majority of installations, and the orders are being placed through representatives of the large machinery builders east of this section.

It is probable that within the coming year a new municipal electric power plant will be built at Sioux City, Iowa. F. W. Cappelen, general manager of the Decarie Incinerator Company, Hopkins, Minn., who is also a consulting engineer, has been retained to make estimates and recommendations.

A number of important improvements will be made next year in the water works system at Waterloo, Iowa, and some new machinery purchased by the municipality.

Construction work will begin in the spring on an electric traction line, known as the Sioux City & Bijou Hills Railway of Sioux City, Iowa, for which extensive power equipment will be required. This may take the form of a hydroelectric plant, supplemented by steam turbines or engines.

Additional power plant capacity will need to be provided in the near future by the Ft. Dodge, Des Moines & Southern Railway, Ft. Dodge, Iowa, to meet the increased operating demands of the system. A steam road between Lehigh and Webster City, which was recently purchased, will be electrified and an extension built from Lehigh to Gypsum.

Soon after February 1 the Omaha & Western Iowa Traction Company will begin the purchase of material, and later on of equipment, for the 90-mile interurban line which it proposes to build from Sioux City to Council Bluffs, with entry into Omaha. The company's address for the present is 3901 North Eighteenth street, Omaha, Neb.

Improved machinery is to be installed in the cyanide plant of the Isabella Mines Company at Cripple Creek, Colo., which has passed under the control of Seattle parties.

The Maya River Power & Land Company, with headquarters in Denver, Colo., is about to start work on a series of hydroelectric plants in Mexico, for which concessions have been obtained. The aggregate power capable of being developed is 270,000 kw. One of the plants, which is to be built on the Santiago River, will furnish power for the Southern Pacific Railroad of Mexico.

A steam hoisting plant will be installed by the Bear Lodge Gold Mining Company, Sundance, Wyo., to replace the gasoline engine driven outfit now in service, and other machinery, including an air compressor, drills, &c., will be provided in order to sink a deeper shaft on the property.

Equipment for driving an 800-ft. tunnel will be installed by the Lehi-Tintic Mining Company, American Fork, Utah.

A bond issue covering the cost of installing a municipal lighting system, with power plant, has been voted at Ansley, Neb.

The Blue River Power Company, Seward, Neb., has been incorporated for $100,000 and will proceed with the extensive hydroelectric development comprised in its plans.

Active preparations are reported to be now in progress by the Pueblo & Suburban Traction & Lighting Company, Pueblo, Colo., for building a new steam turbine power plant of large capacity.

The W. T. Wood Company, Waterloo, Iowa, recently incorporated, will handle a full line of farming machinery, including vehicles, gasoline engines, &c.

S. E. Irish, Keosauqua, Iowa, has purchased the Meek dam and will organize a company to rebuild it and equip it with hydroelectric generators to develop 1200 hp.

Ansley, Neb., has voted bonds in the sum of $5000 for the installation of an electric light plant.

The Oskaloosa Water Company, Oskaloosa, Iowa, will expend about $25,000 for improvements to its plant. Additional pumps will be purchased.

The city of Gunnison, Colo., is considering the installation of new electric light and water works system on the Gunnison River and has retained the firm of Burns & McDonnell, Kansas City, Mo., consulting engineers, who are now on the ground making preliminary surveys and estimates. For the purpose of making this installation it is proposed to issue bonds in the sum of $100,000.

Work is being rapidly pushed on the new plant of the Nebraska Portland Cement Company at Superior, Neb. The first building to be erected will be a machine shop. Upon its completion several other buildings will be erected, one of which will be 60 x 365 ft.

A bond issue of $50,000 has been voted by Atlantic, Iowa, for the purpose of erecting a new light plant and consolidating it with the municipal water plant.

The city of Omaha, Neb., is preparing to establish a garbage crematory. It is estimated that a plant could be installed for $100,000 which could generate sufficient power to light the streets and furnish heat, light and power to the jail and other public buildings.

## The Southwest

KANSAS CITY, MO., December 12, 1910.

Reports from the principal centers of distribution show a quiet condition of trade, but the market is by no means dull. Users of machinery have, as a rule, very clear ideas on the subject of what they need, and the inquiries made some months ago, which were not acted upon at that time, also put them very closely in touch with the relative merits, prices, &c., of the different types of apparatus available for their purpose; hence, as they get to the point where purchases can be made, their minds are quickly made up. This is a feature of the present season's business which eliminates much of the usual fuss and flurry and gives little outward evidence of the actual volume of trade being transacted. The present situation through the Southwest is good and the outlook encouraging.

A dredge of special construction, equipped with its own power plant, and a large motor driven suction pump, will be needed shortly by the city of Wichita, Kan., for work on the Little Arkansas River. The plans for it have been prepared by the city engineer.

P. D. Whatley is about to install machinery for a handle factory at Junction City, Ark., and will increase the capacity later on.

Advices from Bartlesville, Okla., are to the effect that the shops of the new St. Louis, Bartlesville & Pacific Railway are to be located there, together with the general offices of the company.

The electric plant at Tulsa, Okla., is to be enlarged and new machinery provided.

An engineering firm in Kansas City has been engaged to prepare plans and specifications for a pumping plant, water distribution and sewage system at Plattsburg, Mo., the estimated cost of which is within $55,000.

An election will be called shortly at Mound City, Kan., to vote on bonds for constructing a municipal pumping plant.

From Nelagony, Okla., it is reported that the Osago Mfg. Company will install an electric generating plant there to provide current for industrial power and lighting service.

S. A. Lanning, Muskogee, Okla., recently organized a company to install a sash and door factory there.

Upon taking over the local water works, the city of Ft. Smith, Ark., will make extensive improvements and install additional machinery of the most modern type.

Work on a machine and forge shop to be used for repairs and maintenance has been begun at Falls City, Kan., by the Atchison Railway, Light & Power Company, Atchison, Kan. All of the tools will be motor driven.

A new plant is being put in operation at Independence, Kan., by the United Window Glass Company. The equip-

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ment at present installed will be extended as the requirements of the business dictate.

The plant of the Treasure Mining & Reduction Company, Mogollon, N. M., will be remodeled and improved, without, however, the addition of any more machinery at present. A hydroelectric plant was recently installed.

It is reported from Hutchinson, Kan., although without official confirmation, that repair shops and a large roundhouse, as well as a coal handling plant, will be erected there by the Atchison, Topeka & Santa Fe Railway. Other improvements are also to be made. No work is, however, likely to be done before spring.

G. E. Schneider of Chicago, Ill., and N. F. Hancock of Muskogee, Okla., have closed a deal with G. D. Sleeper of Wagoner, Okla., for a tract of land at Falls City, Okla., for $45,000, on which they will erect new buildings for the operation of a packing plant.

The City Council of Durant, Okla., will arrange for installing an electric light plant at a cost of about $12,000, when the plans being discussed are adopted.

## St. Louis

ST. LOUIS, December 12, 1910.

The Illinois Traction System is arranging to purchase an electrical equipment to be placed in the new hydroelectric plant of the Northern Illinois Light & Traction Company, which is a part of the McKinley system.

The John Stanard Bronson Machinery Company, St. Louis, has been incorporated with a capital stock of $5500. The incorporators are L. B. Bronson, J. S. Bronson and L. E. Jacques.

The City Council of Pleasant Hill, Mo., is preparing to establish a water works system.

It is reported that St. Joseph, Mo., is considering the expenditure of a large sum of money for the enlargement of its street lighting plant.

Shirley & Co. are installing a large pumping plant on what is known as the Osyka tract, at Midway, near Joplin, Mo., and will provide operating machinery sufficient to handle the ore which it contains, as the pockets are opened up.

## Indianapolis

INDIANAPOLIS, IND., December 13, 1910.

The Foederer Foundry Company, Indianapolis, has been incorporated with $10,000 capital stock. The directors are A. Foederer, L. S. Foederer and George S. Foederer.

The Union Trust Company has been appointed receiver of the Parry Auto Mfg. Company, Indianapolis, manufacturer of automobiles. The company has $1,000,000 capital stock, of which $150,000 has been paid into the treasury. It is said that the company has orders for over $3,000,000 of its products, but not sufficient capital to fill the orders. The company was organized in July, 1909, and built 900 machines the first year. The expenses of large advertising to get the new car before the public, the cost of experiments, new machinery, &c., left little profit. The liabilities are estimated at $250,000. The petition for a receiver alleged danger of insolvency. It is hoped to have the plant turned back soon into the company's hands.

The Interstate Car Company's plant at Brightwood, a suburb of Indianapolis, was damaged by fire December 10, the foundry being destroyed. E. H. Darrack is president of the company.

The municipal light and water plant at Montpelier, Ind., in receiver's hands, has been ordered sold by the court. John Boyd is receiver.

The Citizens Heat & Light Company, Elwood, Ind., will build an artificial gas plant, to cost $25,000, and will spend $75,000 for an extension of the mains and improvement of the present plant.

The Springer-Whitaker Foundry Company has been incorporated at Terre Haute, Ind., with $10,000 capital stock, to do a general foundry business. The directors are A. H. Springer, A. C. Whitaker and M. A. Whitaker.

The Cardinal Cabinet Company has been incorporated at Wabash, Ind., with $50,000 capital stock, to manufacture cabinets. The directors are G. A. Osborn, J. H. Stigleman, E. L. Weesner, A. E. Osborn and G. A. Wilkinson.

## Government Purchases

WASHINGTON, D. C., December 12, 1910.

The Bureau of Supplies and Accounts, Navy Department, Washington, will open bids as follows:

December 27, schedule 3051, for furnishing and erecting 15-ton traveling crane; schedule 3153, one tool and cutter grinder and one spindle drill press; January 10, schedule 3170, one electric traveling crane; schedule 3171, one engine lathe.

The Paymaster General, Navy Department, Washington, will open bids December 20 for furnishing one 18-in. lathe, schedule 3127, class 61.

The Bureau of Supplies and Accounts, Navy Department, Washington, opened bids December 6 as follows:

Class 51.—One locomotive wrecking crane—Bidder 34, Browning Engineering Company, Cleveland, Ohio, $10,900, $12,700 and $14,700; 119, Industrial Iron Works, Bay City, Mich., $10,300, $11,775 and $12,970; 154, McMiller Interstate Company, Bedford, Ohio, $12,437 and $14,157; 163, Manning, Maxwell & Moore, New York, alternate bid, $16,100.

Class 52.—One swing lathe—Bidder 6, Aumen Milling & Supply Company, Baltimore, Md., $2148 and $2038; 20, Bradford Machine Tool Company, Cincinnati, Ohio, $2170; 87, Fairbanks Company, Washington, D. C., $2429.60; 91, George W. Field, Philadelphia, Pa., $2168; 99, Garvin Machine Company, New York, $2160; 122, I. H. Johnson, Jr., Philadelphia, Pa., $2690 and $2590; 127, J. P. Kemp, Baltimore, Md., $2503.50 and $2255; 163, Manning, Maxwell & Moore, New York, $2205, $2300 and $2050; 173, Niles-Bement-Pond Company, New York, $3970, $3570, $3100 and $2650; 205, Springfield Machine Tool Company, Springfield, Ohio, $2258.

Class 53.—Two swing lathes—Bidder 87, Fairbanks Company, Washington, D. C., $849; 99, Garvin Machine Company, New York, $848; 127, J. P. Kemp, Baltimore, Md., $849.50; 163, Manning, Maxwell & Moore, New York, $955; 173, Niles-Bement-Pond Company, New York, $830; 205, Springfield Machine Tool Company, Springfield, Ohio, $624 and $794.

Class 55.—One universal milling machine—Bidder 18, Brown & Sharpe Mfg. Company, Providence, R. I., $1548.55, $1490.50 and $546.25; 87, Fairbanks Company, Washington, D. C., $1530; 163, Manning, Maxwell & Moore, New York, $1545; 173, Niles-Bement-Pond Company, New York, $1534; 190, Prentiss Tool & Supply Company, New York, $1937.

Class 56.—One toolroom engine lathe—Bidder 127, J. P. Kemp, Baltimore, Md., $982.25; 163, Manning, Maxwell & Moore, New York, $1240; 173, Niles-Bement-Pond Company, New York, $992; 190, Prentiss Tool & Supply Company, New York, $1054.

Class 111.—One Scotch boiler—Bidder 54, W. P. Cramp & Son Ship & Engine Building Company, Philadelphia, Pa., $3785 and $3550; 78, P. Dulany & Co., Newburgh, N. Y., $4350; 132, E. Keeler Company, Williamsport, Pa., $3640; 163, Manning, Maxwell & Moore, New York, $4500; 174, New York Ship Building Company, Camden, N. J., $3725; 206, Springfield Boiler Mfg. Company, Springfield, Ill., $3800; 240, Vermilye & Power, New York, $4925.

Class 121.—One plate bending machine—Bidder 52, Cleveland Punch & Shear Works Company, Cleveland, Ohio, $2600; 117, Hilles & Jones, Wilmington, Del., $3868; 127, J. P. Kemp, Baltimore, Md., $3575, $3610, $3005, $3100, $3575, $3685, $3735; 173, Niles-Bement-Pond Company, New York, $3985; 214, William Sellars & Co., Philadelphia, Pa., $5900; 244, Wickes Brothers, Saginaw, Mich., $3271 and $2796; 253, Covington Machinery Company, Covington, Va., $3000.

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**Chinese Ore and Pig Iron for Japan.**—The Hanyang Iron Works, Hankow, China, is reported to have contracted to supply Japan with 100,000 tons of iron ore and 100,000 tons of pig iron a year for 20 years for use at the Japanese Government Steel Works at Yakamatsu. The Hankow company, it will be remembered, also had a contract to supply ore and pig iron to the Western Steel Corporation, Seattle, Washington. If the Japanese contract is an absolute one and the tonnages not merely maximum amounts, which may be scaled down, the Chinese works, it would seem, will have little pig iron to sell in the general export market. A portion of its pig iron now goes into rails and will undoubtedly continue to be so used.

**Case Hardened Gears for Railroad Work.**—The R. D. Nuttall Company, Pittsburgh, has introduced an innovation into railroad equipment parts by bringing out case hardened gears and pinions. The company has had a good many of these in service for some time, but deferred making any announcement until experience had shown that such gears would perform well under severe conditions. The operation of those experimented with has been so satisfactory that the company has decided to make case hardened gears and pinions a part of its regular lines.

Large contracts for Detroit Fenestra solid steel windows have recently been made for the new buildings of the Solvay Process Company, Detroit; Michigan Alkali Company, Wyandotte, Mich., and also to fill the openings in additional buildings of the Steel Corporation, at Gary, Ind. The Detroit Steel Products Company is developing a very large business in this novel product, which is gaining so much success, particularly among large manufacturing interests.

# Obituary

### HENRY FAIRCHILD DE BARDELEBEN

Col. Henry Fairchild De Bardeleben, the pioneer iron and coal operator of the Birmingham, Ala., district, whose death at Birmingham December 6, 1910, has already been noted, was born in Autauga County, Alabama, in 1841. His industrial operations began in 1871, when with Daniel Pratt, his father-in-law, he acquired an interest in the Red Mountain Iron & Coal Company. In 1876 Colonel De Bardeleben took charge of the old Oxmoor furnaces as general manager, and the first coke iron was made there. He was associated with T. H. Aldrich in opening up what is now Pratt City and mined the first coal there. Later he disposed of his holdings in the Pratt Coal & Coke Company to Col. Enoch Ensley. The building up of the town of Ensley came soon after. Colonel De Bardeleben formed a partnership with W. T. Underwood and the firm of De Bardeleben & Underwood was connected with a number of enterprises in Alabama. He started

HENRY FAIRCHILD DE BARDELEBEN.

the Mary Pratt furnaces, now abandoned, established the city of Bessemer and built a rolling mill there, besides other plants. His holdings finally went into the Tennessee Coal, Iron & Railroad Company, of which he was at first vice-president, but soon left the company to engage in independent enterprises. He took part in the Civil War as one of the Prattville Dragoons of the Confederate Army, but Governor Shorter put him in charge of some mills at Prattville and he returned to that place about a year after his enlistment. He was regarded as Alabama's most remarkable industrial figure.

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WALTER L. PIERCE, secretary and general manager of the Lidgerwood Mfg. Company, 96 Liberty street, New York, died suddenly December 10, aged 55 years, of heart trouble. He was also vice-president and treasurer of the Gorton & Lidgerwood Mfg. Company, maker of heating boilers, and treasurer of the Hayward Company, 50 Church street, New York. He became associated with the Lidgerwood Mfg. Company early in his business career and spent 32 years in its service, during most of which time he was secretary and general manager. He was particularly successful in handling the financial end of business enterprises. He was active in trade associations, having been one of the organizers of the National Metal Trades Association, and acted on the Arbitration Committee when the agreement was made between that association and the International Association of Machinists in 1900, which was abrogated in 1901. He was one of the oldest members of the Engineers' Club, and was the first treasurer of the Machinery Club of the City of New York. He also took an active interest in the affairs of the National Association of Manufacturers and was a member of the American Society of Mechanical Engineers and an associate member of the Society of Naval Architects.

WILLIAM L. CASADAY, plow manufacturer, of South Bend, Ind., died December 10 at his winter home at Ocean Park, near Los Angeles, Cal., aged 66 years. He was president of the South Bend Chilled Plow Company, which he organized 23 years ago. While working as a mechanic, he solved the problem of making chilled plow shares, and this discovery was the foundation of his fortune. He received more than 200 patents on various articles and devices. He was the inventor of the Casaday sulky plow, one of the first riding plows to be generally used in the United States. He was born near New Carlisle, Ind., and followed farming in his younger years. He leaves a widow, two sons and two daughters.

FRANK S. GORTON, Chicago, died December 12 of heart failure, aged 63 years. He was born in Rochester, N. Y., and was graduated from Rochester University. In 1887 he was active in organizing the Chicago Edison Company and was secretary and treasurer of that company until 1902. He was also treasurer of the Standard Pneumatic Tool Company until his retirement from active business.

## The Bethlehem Steel Company and Texas Ore Lands

The periodic report of the acquisition of Texas iron ore lands by the Bethlehem Steel Company has been published again in the past week. It is stated that "Charles M. Schwab and associates have acquired practical ownership of 100,000 acres of land in the iron producing fields of eastern Texas, the land being situated in Cass, Morris, Harrison and Gregg counties." Then follows the old report of a contract for 30 miles of railroad from Longview northeast to the ore fields, this line to connect with the Santa Fé and shipments to be made over the Port Bolivar docks of the latter. According to authentic information in the hands of *The Iron Age*, the whole story, so far as it relates to the Bethlehem Steel Company or its officers, is without foundation.

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**The Philadelphia Associated Foundry Foremen.**—The regular monthly meeting of the Associated Foundry Foremen of Philadelphia and Vicinity was held at the Manufacturers' Club, Philadelphia, on the evening of December 13, President Clarence R. Brown in the chair. A committee consisting of George W. Beukert, John Butterworth and John Alexander was appointed to revise and present to the association for action certain changes in the by-laws. The subject for the evening's discussion was "Hand Molding *versus* Machine Molding," which was continued from the last meeting. Messrs. John Foley, John Alexander, J. Butterworth, James Whitehead, George W. Beukert and George W. Moore took part, and the various features of both methods and the class of work for which they were particularly adaptable were discussed at length. The judges of the discussion, Messrs. Thomas Devlin, Josiah Thompson, Howard Evans, J. Howard Sheeler and George C. Davies, will announce their decision as to which side had brought out the most telling points at the next meeting of the association.

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The William Cramp & Sons Ship & Engine Building Company, Philadelphia, has been awarded a contract to build two vessels for the Cuban Government. One will be a cruiser of 2000 tons, the other a training ship of 1000 tons displacement.

# New Publications

**Iron and Steel** (A Pocket Encyclopedia), Including Allied Industries and Sciences.—By Hugh P. Tiemann; introduction by Henry Marion Howe. Flexible leather binding; pages, 354; pocket size, 4 x 6½ in.; illustrations, 43. Published by the McGraw-Hill Book Company. For sale by the Book Department of the David Williams Company, New York. Price, $3, postpaid.

There have been books on the metallurgy of steel—quite a number of them in the past few years in the United States and Great Britain—and nearly all have had a place and have filled it. But all the time there has been a want unsupplied, and Mr. Tiemann's book comes to fill it, and does fill it most admirably. One measure of the demand for such a handbook is furnished by the inquiries that in the course of a year find their way to the editorial desks of *The Iron Age*. Their name is legion and their variety scarcely less. There was need that some one with wide experience in iron and steel works and thoroughly acquainted with the language of the mills, the laboratory and the office, should put in pocket handbook compass a thousand and one definitions, explanations of processes, and historical and contemporary references, gathering up in small compass the operations connected with every form of blast furnace, steel works and rolling mill product. Mr. Tiemann has shown rare fitness for the task, and it is safe to predict that his book will soon be one of the staples in the literature of the industry.

The introduction by Professor Howe is a literary nugget. He tells how the author has come to the aid of the millman, the metallographist and the commercial man, each of whom has his own jargon, and has interpreted each to the other. As an example he gives this:

> Foreman: "How does this steel work?"
> Heater: "If you don't wash it, it won't clean."
> This is "shorthand" for: "The iron oxide or 'scale' which forms on the surface of this steel adheres so firmly that, unless it is heated so highly that it melts, some of it will cleave to the metal during the operation of rolling, and hence will deface the finished plates into which the steel is to be rolled." The heater's words are not English; they are jargon, and it is proper that they should be. If he persisted in translating them into English as I have done, and in talking English in general, he would simply justify the dismissal which would surely come.

The author tells in a brief preface what he set out to do, which was to combine in a compact book a dictionary, a cyclopedia and a handbook. His problem was to make more than a mere mention book—to give explanations and at the same time come within pocket size. He might well have called it "The Iron and Steel Handbook," for he has put into it something about practically everything that the millman, the salesman, the buyer, the metallurgist and the student wants to know. He may introduce many of his readers to "coal apples," "Igewsky's reagent," "shudes," "sibbering," "Schreibersite" and "Angus Smith's process." However, these out of the way things are not the measure of the value of the book; rather, its excellent treatment of the ordinary matters that every man connected with the trade needs to know about. There are very good summations, for example, of "Chemistry," "Metallography," "Direct Processes" and "Purification Processes." There are 8 pages on "Pig Iron," 4 pages on "Sheets and Tin Plates," 5 pages on "Protection" (against corrosion), 6 pages on "Mold and Molding," 2½ pages on "Iron Ore," 8 pages on "Blast Furnace," 7 pages on "Casting," 10 pages on "Bessemer Steel," 9 pages on "Open Hearth Process," 6 pages on "Puddling," 17 pages on "Rolling," 5 pages on "Heat Treatment," 4 pages on "Special Steels." The dictionary is exhaustive and the cross references abundant.

Testing the book repeatedly by searching for a word or subject, one finds that the author's quest for material has been most painstaking. Little has escaped him. In the matter of trade names he has had some difficulties. "Siloxicon" is referred to, but not "Monel metal." The Bookwalter converter does not appear in the "baby" Bessemer list, nor does the Jones Step process in the long list of direct processes. The sclerometer is given among devices for testing hardness, but not the scleroscope. "B. W. G." is interpreted, but there is no reference to U. S. Standard Gauge. "Stripping plate" is defined in connection with molding machine description, but not "match plate." "G. M. B.," the "good, merchantable brands" of the British pig iron warrant market, does not appear, nor does the word "warrant." In the reference to the Catalan forge, the primitive trompe which furnished the blast might have been mentioned. But the very conspicuousness of an omission is the best token of the completeness of the book. Its appearance is an event of first-class importance, and Mr. Tiemann is to be thanked for the service he has done the whole industry. So far as material return for such authorship is concerned, it is very apt to be, at best, on the testimony of one who has made a conspicuous contribution to the literature of steel, about on the scale of day laborer's wages.

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**The Mechanical World Pocket Diary and Year Book for 1911.**—Twenty-fourth year of publication. Size, 4 x 6 in.; pages, 423. Bound in cloth. Price, sixpence net. Published by Emmott & Co., Ltd., 65 King street, Manchester, England.

In presenting this yearly revised engineers' pocketbook, some 32 pages have been added, and by carefully revising and condensing, space has been provided for the introduction of a large amount of new matter. Among the special features of this edition are a lengthy section on the shapes, speeds and feeds of cutting tools with supplementary sections dealing with milling cutters and twist drills. The section on standard screw threads is entirely new, and that dealing with screw cutting has been extended considerably. Other new sections deal with high speed steel and the constructive details of gas engines. Several additions have been made to the tables of weights, measures, &c., and a new table of steam fittings and tables and data on marine boilers, riveted joints, &c., are included. The subjects, of course, are treated from the standpoint of British practice, but after all the underlying principles are the same the world over, and the book will undoubtedly be found of value to American engineers who use the English system of weights and measures.

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We have received Vol. VI of the *Proceedings* of the National Association of Cement Users, covering the sixth annual convention, which was held at Chicago, February 21 to 25, 1910. It comprises 738 pages, and contains all the papers and discussions. Many of the papers are illustrated. The contents are exceedingly valuable to all interested in cement or concrete work. It is edited by the president, Richard L. Humphrey.

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"Business Prospects, 1911," is the title of a book received from the Business Statistics Publishing Company, Ltd., 12 James street, Cardiff, Wales, which presents statistics of coal, iron, copper, tin, wheat, cotton and other commodities and makes forecasts for the coming year. The forecast relative to the iron and steel trade in 1911 is that the demand will show some, but no great advance on that of 1910; the capacity of production will still exceed the demand; employment will be regular with wages at about present rates; prices will average figures slightly below those of 1910. As to copper the prediction is made that the output will be kept below consumption; the average price over the

year will be above that of 1908, 1909 or 1910; copper securities will improve in value. The forecast for tin is that the demand will increase to a greater extent than the supply; tin prices will average higher than in any year since 1907. The book comprises 280 pages, including advertisements. The price is 5 shillings.

## Personal

Peter Donaldson, of James Watson & Co., Glasgow, Scotland, who has been in this country for the past two months, sails for home on the Mauretania this week.

H. S. Snyder, vice-president of the Bethlehem Steel Company and of the Juragua Iron Company, is in Cuba visiting the iron mines of the latter company in the Santiago district.

Robert R. Barringer has been appointed assistant superintendent of the Payne & Joubert Machine & Foundry Company, Birmingham, Ala.

Paul Koning, late American representative of Brandeis, Goldschmidt & Co., London, and who recently resigned as president of the New York Metal Exchange, will sail December 17 for Berlin, Germany, where he will represent the American Smelting & Refining Company.

Robert E. Jennings, formerly president of the Taylor Iron & Steel Company, has purchased an interest in the Titan Steel Casting Company, Newark, N. J., and has been elected president of that company.

Charles W. Guttzeit, district manager of the Taylor Iron & Steel Company, with offices at 100 Broadway, New York, has resigned his position to take effect January 1, and will become general manager of the Titan Steel Casting Company, Newark, N. J.

Charles G. Armstrong, consulting engineer, Singer Building, New York, has taken into partnership his son Francis J., under the firm name of Charles G. Armstrong & Son. The senior Armstrong is well known in connection with the planning and construction of important buildings in several of the largest cities, and is also the inventor of many modern office building devices, particularly the elevator signaling system, which is in practically universal use, and which for many years has been manufactured by the Elevator Supply & Repair Company. His son is a graduate of the Manual Training School of the University of Chicago and of the Stevens Institute of Technology, and has been engaged with his father in consulting engineering work for the past year.

Charles M. Ams, president of the Max Ams Machine Company, Mount Vernon, N. Y., has returned from a very successful three months' trip in Europe and the continent, establishing new agencies for the sanitary solderless sealed can and the Ams double seamers, many of which he sold. The new Ams factory at Turin, Italy, is completed, thoroughly equipped, and is one of the largest industries in southern Europe.

S. L. Kamps has been elected secretary of the T. H. Symington Company, manufacturer of Symington journal boxes and Farlow draft gear, with general offices at Baltimore, Md.

W. W. Stephens, president of the Stephens-Adamson Mfg. Company, Aurora, Ill., has returned from Europe. He has been spending some time in the study of the shops and methods of the larger manufacturing establishments of England, France and Germany.

Joseph M. Jenckes, for several years superintendent and chief engineer of the Riverside Engine Company, Oil City, Pa., will sever that connection January 1 to engage with the Nagle Corliss Engine Works, Erie, Pa., as designing engineer. He is patentee of the Jenckes Corliss type of valve used on gas engines.

Frederick R. Simms, president of the Simms Magneto Company, 1780-1782 Broadway, New York, returned from abroad December 3, and is now actively engaged in the organization of the company's new plant at Bloomfield, N. J. The builders of this plant claim that it will be the largest and finest equipped magneto works in this country if not in the world.

F. B. Richards of M. A. Hanna & Co. has been elected president of the Lake Superior Iron Ore Association to succeed William G. Mather of the Cleveland-Cliffs Iron Company, who has been president of the association for a number of years. H. G. Dalton of Pickands, Mather & Co. was elected vice-president, and H. S. Stebbins of Oglebay, Norton & Co., treasurer. W. B. Treat resigned as secretary and is succeeded by W. L. Tinker.

Clarence H. Booth, who has been manager of the No. 3 plant of the E. M. F. Company, Detroit, has been appointed as the company's general manager of manufacturing, to succeed the late David Hunt, Jr. Charles Sweet succeeds Mr. Booth.

Robert Wuest, Cleveland, Ohio, commissioner of the National Metal Trades Association, has gone to the Bermudas for a stay of a few weeks.

William S. Stephenson has resigned his position as secretary and treasurer of the Toledo-Massillon Bridge Company, to take the agency for the Beach-Edison traction car in the States of Ohio, Indiana and Michigan. His headquarters, for the present, will be in Toledo. This car is run by the Edison storage battery, independent of trolleys and overhead wires.

The American Emery Wheel Works, Providence, R. I., was awarded a gold medal at the Brussels Exposition for its exhibit of grinding wheels and abrasive products.

## The British Iron Market

The probability of a settlement of the shipyard boiler makers' lockout has created a better feeling in the British iron trade. In general the market there has been halting, and the outlook for the future is not well defined. Prices have changed but little. No. 3 foundry iron has been quoted for some time at close to 49 shillings 9 pence, Middlesbrough, for delivery this year, and at 50 shillings 3 pence to 50 shillings 6 pence for delivery in the first quarter of 1911. Shipments of Cleveland pig iron in November were 106,858 tons. For the 11 months ending with November these shipments were 1,101,359 tons, against 1,099,815 in the first 11 months of 1909, 1,225,857 tons in the same period of 1908, and 1,654,409 tons to November 30, 1907. Pig iron stocks in Connal's stores increased nearly 21,000 tons in November, the total at the beginning of this month being about 510,000 tons.

If work at the shipyards is resumed as expected more activity will result throughout the trade in finished material. Recent rail orders taken by British mills amount to about 20,000 tons, including 6500 tons for the Bombay & Baroda Railway, and 7850 tons for the Great Indian Peninsular Railway. Among pending inquiries is one for 9000 tons for the Pekin-Kalgan Railway. The Burmah Railways are in the market for 4000 tons. The Lithgow Iron Works, New South Wales, has undertaken to supply 10,000 tons of steel rails to the New South Wales Government in 1911 and in following years to supply the requirements of the Government, estimated at 20,000 tons a year.

The London *Ironmonger* says: "It is regarded by some people as of great significance that the United States Steel Corporation, who were ready to sell semi-products for January-June shipment on the basis of about 91 shillings 3 pence, c.i.f. Wales, for sheet bars, are now declining orders for shipment later than June. This seems to indicate a belief that the last half of next year will witness a considerable expansion in the American iron and steel trades."

# The Industrial Training of Boys—II

## Education and the Development of the Apprentice*

BY J. J. FLATHER,† MINNEAPOLIS.

### Half-Time Schools as Proposed by P. Higgins

Eleven years ago P. Higgins presented a paper of remarkable interest before the American Society of Mechanical Engineers in which he advocated the establishment of half-time schools for the "education of machinists, foremen and mechanical engineers." ‡

The chief features of the proposed half-time schools as presented by Mr. Higgins are:

1. A school which shall include a first-class commercially successful and productive machine shop, which is a department co-ordinate in importance, influence and educational value with the academic department.
2. A school in which the pupils are to have instruction and practice in this shop during half the working hours in five days of each week for a period of four years.
3. Instruction in the public school during a portion of the other half of the time, equivalent to a high school course, restricted, abridged and improved to meet the needs of the pupils.
4. Special care and method of selection of pupils who have finished the grammar school course and who have special aptness for mechanical work.
5. Management under a corporation whose trustees shall be practical business men.

Mr. Higgins states that the main thing which should determine the point where schooling had better be stopped and the real work begun is the natural endowment of the pupil, so that whenever he stops he has received the best possible course of schooling and training for his particular career, whether it be a machinist, draftsman, foreman or manager. And if he has aspirations and natural ability for some position higher, not within the scope of the half-time school, this course may lead to the technical school. If he is not adequate to undertake such work, it should not be the fault of his school training but due to the limit of his natural capacity.

We are in hearty accord with the object and methods of the proposed half-time school and believe that this would afford an excellent means for developing American "machinists, foremen and mechanical engineers," as stated by Mr. Higgins. But if we are to greatly benefit the large body of workers we must go down the line further and begin the training process in the elementary grades.

The secondary industrial school of Columbus, Ga., follows very closely the lines laid down by Mr. Higgins, except in the educational requirements. Here we find a school in operation 11 months in the year, spending seven and one-half hours per day, including Saturday, of which time from 24 to 30 hours per week are spent in some form of industrial training—carpentry, pattern making, machinists, cotton mill work, and business training. The full time required in each course is three years, which is really equal to four years of the present school systems. The requirements for admission are a common school education through the sixth grade and a minimum age limit of 14 years. The school is under the direction of the city superintendent and trustees, assisted by an advisory board of five experts chosen from the leading industries and commercial interests of the city.

Time does not permit of a discussion of other interesting trade schools which have been established in recent years throughout the country. Suffice it to say that most of the municipal trade schools embody many of the features of the half-time school, including immediate supervision by an Advisory Committee made up of men experienced in the trades to be taught. The aim of the schools is to train boys in the fundamental principles and intelligent practice of a trade so that they will be able to confidently enter the industries and receive a fair wage at the start.

### Industrial Schools at Indianapolis and Columbus, Ga.

The National Trade Schools at Indianapolis maintain an excellent course in foundry practice which requires completion of the grades and a minimum age limit of 16 years for entrance. The course covers a period of two years and demands a total of 55 hours per week throughout the entire year; 7 hours per day are devoted to shop practice and the rest of the time is spent in mechanical drawing, foundry chemistry, shop lectures and shop mathematics. A tuition fee of $100 per annum is charged. Commercial work is undertaken to a large extent and for this the boys receive compensation, so that not only are they able to earn an amount equal to the tuition charges but it frequently happens that a boy is able to earn his entire expenses.

The foundry is maintained as a high grade jobbing shop, and each student during the latter part of his course must assume the duties of shop foreman. It has been demonstrated in this school beyond question that skilled molders can be developed in two years by systematic training in which the reason why is dominant; but experience shows that the best results are obtained only with the older boys.

It is significant that in one of these, the Milwaukee School of Trades, the age limit for admission is about to be reduced from 16 to 14 years. This is inevitable, for, if a boy has to wait until he is 16 years before he begins to learn a trade, and if an employer will take him on at this age and pay him wages at the same time he is learning the trade, the boy will take the wage proposition every time and the trade school will not get the student no matter how valuable the courses given.

### The Cincinnati Co-operative Plan

A half time school for engineering students has been developed by Professor Schneider of the University of Cincinnati in conjunction with the manufacturers of his locality, which is now known as the co-operative plan. Under this plan the students are paired or divided into sections and alternate between factories and class-room week about during the collegiate year, while full time is worked during the summer. The entire course occupies six years, and the students are paid while working in the shops at such rates that the total earnings during the course amount to about $1800. This makes it possible for a larger number of worthy young men to get an engineering education, strongly reinforced with shop practice and business training.

Under favorable conditions the co-operative plan ought to work out well in the training of boys in the trades or other vocations in any large industrial center, no matter what the principal industries may be; but to be successful two things are essential, namely: 1. A willingness to co-operate on the part of the employer.

* Read before the National Founders' Association, Chicago, November 16, 1910.

† Professor of Mechanical Engineering, University of Minnesota.

‡ American Society of Mechanical Engineers, *Transactions*, Vol. XXI.

2. Suitable physical and mental development on the part of the boy.

In Cincinnati the boys who are selected for this co-operative work must have a preparation equal to that for college entrance, and, in consequence, the boys who are eligible must be drawn from the 10 per cent. of the school population who finish the high school; thus the employers are getting the pick of hundreds of young men from 18 to 20 years of age at the start. It is evident that this education is intended primarily for those who are being trained for the higher positions in the various industries, and it is reasonable to assume that not many who complete the work will continue as skilled tradesmen.

It is safe to say that manufacturers would be loath to enter into an agreement of this sort with immature boys, so that this half-time co-operative plan, if applied to the trades, would require an age limit which employers almost universally state could hardly be earlier than 16. To make such a proposition attractive to employers, the boys must have a certain amount of education and mental development, coupled with a sense of responsibility, in order to make it worth while.

If we adopt completion of the grade schools as the minimum educational requirement, usually 14 or 15 years of age, this means that practically 25 per cent. of these boys who enter our public schools would be deprived of the opportunity of entering the industries or of learning a trade through the half-time co-operative plan, assuming that the various state laws would permit it; and of those who would be eligible very many would have been out of school from one to two years before they reached the age of 16, for 78 per cent. of the pupils drop out of school before reaching the end of the second year in the high school.

Notwithstanding all these agencies for securing intelligent skilled labor, employers, both in business and industrial activities, are constant in their demand for boys better fitted to enter upon their careers. The conclusion is again forced upon us that the schools must modify their courses and give industrial training for those who desire to enter upon an industrial vocation.

### How to Use Ordinary Schools for Industrial Training

Following somewhat the recommendations of Dr. J. P. Haney, Director of Manual Training in New York, I would urge that manual training be taught in all our elementary schools, and that at the end of the sixth grade, corresponding to the age of 12 or 13 years, separate elective courses be established—the one, as at present, arranged for professional and commercial training, as well as the higher technical training, leading to and through high school; the other having in view the industrial training of the pupil. Bearing in mind the class of boys it is desired to interest and develop, and the object to be attained, practical work should predominate; but during the seventh and eighth grades—that is, the first two years—the training should be general, with a view to increasing the versatility of the boy, rather than his specific training during these years. In order to keep the boy busy, inasmuch as there would be less preparation of studies, it would seem desirable to require that six or seven hours a day be spent in the school, of which time at least one-half should be devoted to industrial work under skilled workmen; the rest of the time could be divided between such subjects as drawing and the study of industrial geography, some history, English and arithmetic; this latter should contain plenty of practical problems of interest to the pupils. There should also be shop talks relating to the various industries.

Two additional years would follow this industrial preparatory, and these should be trade preparatory, in which the time spent is devoted to some one definite trade, to the end that by judicious and intelligent training the boy may enter some industry where he will be given an opportunity at fair wages, under an apprentice instructor, to finish the trade begun in the trade preparatory school. In this school, which a boy enters at 14 or 15 years of age, the time could well be increased to eight hours a day with four hours on Saturday, and there seems no good reason why the practical work should not be continued for 11 months of the year. The amount of time spent in practice would vary somewhat, but in general in most trades four hours a day could be devoted to shop work and the remaining four hours divided between drawing and other studies more or less related to the specific trade. During the course history and civil government, English, arithmetic, practical geometry and physics should be given some attention. An important feature of this course would be the co-operation of an Advisory Committee suggested by Mr. Higgins. This would materially assist in co-ordinating the work of the school with that of the various industries, and it is not at all improbable that in many localities satisfactory arrangements could be made by which the more advanced pupils might, under proper instruction and suitable wage conditions, be employed on commercial work for local firms. This would greatly increase the interest and would furnish a stimulus for speedy work usually lacking in school shops.

The amount of time required to finish a trade would be reduced very materially under such a plan, and it is safe to say that the hope of early reward would encourage many a boy to hold out and complete the entire high school course instead of quitting as at present. It is not to be expected that all such boys would become skilled tradesmen, but it must be conceded that the training could well be adapted to prepare all boys who might desire to enter industrial pursuits and, by a process of selection and elimination, those best qualified by natural endowment and otherwise could be trained as all round men for the trades, while others who did not give such promise of development would be trained for some special work, as, for instance, machine molding in the foundry or machine hand in other industries.

### No System Applicable Everywhere

It is recognized that no universal system of trade education will be generally applicable to every community. Local conditions will suggest and demand modifications, and we should expect in certain localities to find emphasis laid on the teaching of trades required in the industries which predominate in the vicinity. Thus, where cotton spinning and weaving are carried on extensively we should expect that provision would be made for this work in the trade preparatory school of that section; the same can be said of the boot and shoe industry, paper making, dyeing and many others peculiar to a given locality.

In working out the course of study for such industrial education, it should be constantly borne in mind that some of the boys who enter upon industrial training will reach a time in their lives when they will want to keep on with the studies and enter a technical college. Provision for such boys must be made by a modification of the high school courses with this in view, and, if necessary, the college entrance requirements should be changed.

It is admitted that the expense in equipment and maintenance of such departments in our public school system would be considerably greater than that now incurred, but it is submitted that the cost is a matter of lesser import than the results. Attractive industrial departments, manned by enthusiastic, capable, properly paid teachers, would cause a greater number of pupils to remain in the schools for a longer period, and the intellectual development, coupled with the training in discipline received by additional thousands of school children all over the country, would in itself be an economic advantage. Moreover, if the introduction of such departments would afford better preparation for the industries and reduce the idle or waste years of a

boy, the productive gain and increase in wealth in a given community would more than warrant any reasonable additional cost. On the other hand, the expense involved on account of "repeaters" would be greatly diminished and the amount thus saved would materially assist in maintaining industrial schools.

It is also submitted that the hopes and ambitions of a boy, the habits of industry, the definiteness of purpose in life, inspired by contact with real things, all make for a higher uplift which will result in social betterment of the people and its attendant lessening of crime fostered by idleness.

While the problems involved are many and far reaching, it is confidently believed that the interest and co-operation of employers with school officials will bring about a system of education which will not only benefit the boy and make him a more intelligent citizen, better fitted to fill his sphere of usefulness, but at the same time American industries will profit because of the more intelligent and contented body of wage earners which will result from such co-operation.

## Costly Shipbuilding in Government Yards

WASHINGTON, D. C., December 13, 1910.—As foreshadowed in this correspondence last week, the Secretary of the Navy has transmitted to the House Committee on Naval Affairs a letter urgently requesting Congress to increase the limit of cost of the battleship Florida, now being built at the Brooklyn Navy Yard, from $6,000,000 to $6,400,000. This increase is made necessary by reason of the fact that the Government is unable to build as cheaply as private shipbuilders, being compelled to operate on the eight-hour basis and under other conditions which make for increased cost. The Secretary states that it will cost $239.24 per ton of normal displacement to build the Florida, as compared with $180.80 for the Utah, which is building in a private yard.

A recommendation is also embraced in the Secretary's letter for an increase in the limit of cost of the battleship New York, appropriated for last winter, from $6,000,000 to $7,500,000. The experience gained in the work thus far done on the Florida has made it clear that the New York cannot be built at the Brooklyn Navy Yard for the sum appropriated, and no steps will be taken to lay the keel of this vessel until Congress has acted.

In this connection, the Secretary of the Navy is in receipt of a proposition from the Newport News Shipbuilding & Dry Dock Company to build the battleship New York at the same figure recently submitted by that company for the New York's sister ship, the Texas—namely, $5,783,000. Under the law as it now stands the Secretary has no power to accept this proposition, but, of course, it is entirely competent for him to submit it to Congress with a recommendation. No decision has yet been reached in the matter, but the tax payers of the country, as well as the shipbuilders, will be interested to learn whether the Secretary regards it as worth $1,717,000 to have the New York built in a Government yard. W. L. C.

The Lathbury-D'Olier Company, Morris Building, Philadelphia, Pa., announces a merger of the interests of B. B. Lathbury, consulting engineer, and of the D'Olier Engineering Company. The new company, with enlarged scope and facilities, will continue the general and special engineering, manufacturing and contracting business heretofore carried on by the respective interests. Mr. Lathbury was formerly president of Lathbury & Spackman, Inc. The new company has established a branch office at 114 Liberty street, New York. With enlarged shop facilities in Philadelphia, it is prepared to carry on more extensive work than formerly.

## The Philadelphia Foundrymen's Association

The regular monthly meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on the evening of December 7, Vice-President Elmer E. Brown occupying the chair. An invitation extended to the association by the New England Foundrymen's Association to attend its annual banquet at the Exchange Club, Boston, Mass., January 11, was accepted, and a committee composed of August A. Miller, J. Howard Sheeler, Josiah Thompson, Elmer E. Brown and George C. Davies was appointed to make arrangements to take as large a delegation as possible to Boston on that date. A communication from the National Rivers and Harbors Congress, in session in Washington, D. C., was read, and Thomas Devlin, president of the association, was appointed to represent the organization at the meeting.

A Nominating Committee, consisting of George C. Davies, A. A. Miller and H. C. Matlack, which had been appointed to suggest nominations for officers for the coming year, presented the names of the present officers for re-election, as follows: For president, Thomas Devlin, Thomas Devlin Mfg. Company; vice-president, E. E. Brown, E. E. Brown & Co.; treasurer, Josiah Thompson, J. Thompson & Co.; secretary, Howard Evans, J. W. Paxson Company; Executive Committee—Walter Wood, R. D. Wood & Co., Philadelphia; Thomas M. Eynon, Eynon-Evans Mfg. Company, Philadelphia; H. L. Haldeman, Pulaski Iron Company, Philadelphia; Walter T. MacDonald, Schaum & Uhlinger Company, Philadelphia; Walter S. Bickley, Penn Steel Casting & Machine Company, Chester, Pa.; Trustees—Thomas Devlin, Josiah Thompson, Howard Evans; official chemist, George C. Davies. The election will be held at the January meeting.

A brief discussion on trade conditions followed, and in several instances a somewhat better volume of business was reported, with an encouraging outlook for the future in some directions.

The paper for the evening's discussion was read by James Whitehead of the Abram Cox Stove Company, Philadelphia, describing an automatic flask bar tucker, which he has invented. A practical demonstration of the working of the tool followed the reading of the paper. For this purpose a large flask with a barred hinged cope was used, and the sand tucked under the bars with the tool, showing the ease with which this is accomplished. Repeated operations showed the satisfactory result of the new method. In discussion it was brought out that nailed or partly burnt bars interfered in no way with the operation of the device, and that it had had a long tryout, particularly in stove plate work and in a number of other classes of work where barred flasks have been used. At the conclusion of the demonstration a vote of thanks was extended Mr. Whitehead, after which luncheon was served in the dining room of the club.

**An Extensive Railroad Contractors' Plant.**—The Twohy Brothers Company, railroad contracting, will make Portland, Ore., the headquarters of its operations in the future. A tract of 17 acres has been purchased near Portland, on the Oregon Railway & Navigation Company's tracks, and a large plant is being erected. The general repair shop will be 80 x 180 ft., with an erecting floor extending the length of the building and machine car and engine shops along the side. The building will have a 20-ton Niles crane of 37-ft. span. Four warehouses are in course of erection—one for commissary goods, one for repairs of machines and equipment, one for iron and steel and one for wood stock. A power house will have two 100-hp. boilers to supply steam for hammers and for heating. Electric power for operating the shops will be purchased from the Portland Railway, Light & Power Company. The equipment for the shop has been purchased.

# The Development of the Air Brake*

BY GEORGE WESTINGHOUSE, PITTSBURGH, PA.

A train upon which I was a passenger in 1866 was delayed a couple of hours due to a collision between two freight trains. The loss of time and the inconvenience arising from it suggested that some means of applying brakes to all of the wheels was needed.

The first idea which came into my mind was to connect the brake levers of each car to its draft-gear, so that applying the brakes to the locomotive, which would cause the cars to close up, would apply the brakes to the wheels of each car. Shortly afterward I was invited to inspect a train fitted with the Ambler chain brake, which consisted of a windlass on the locomotive revolved by pressing a grooved wheel against the flange of the driving wheel to wind up a chain attached to the brake levers of each car.

As an improvement on Mr. Ambler's plan, I considered the use of a long cylinder to be placed under the locomotive, the piston to be connected to the chain and driven by steam from the locomotive boiler. A short study of this showed that it would be impracticable for more than four or five cars.

My next thought was to place a steam cylinder under each car with a pipe connection from the locomotive, but a little experimentation disclosed the fact that it would be impossible, even in warm weather, to successfully work the brakes by steam. Shortly after I reached the conclusion that brake apparatus of this kind could be operated by compressed air upon any length of train, and in 1867 I filed a caveat in the United States Patent Office to protect the invention. In the meantime I met Ralph Baggaley, who undertook to defray the cost of constructing the apparatus needed to make a demonstration. The apparatus was completed in the summer or early autumn of 1868 and was applied to a train of a locomotive and four cars.

### The First Air Brakes

The essential parts of the air brake as first applied were an air pump steam driven from the locomotive boiler; a main reservoir on the locomotive into which air was compressed to about 60 or 70 lb. pressure; a pipe from the reservoir to a valve mechanism convenient to the engineer; brake cylinders for the tender and each car; a line of pipe from the brake valve under the tender and all of the cars, with a pipe connection to each brake cylinder, and flexible hose connections between the cars with couplings having valves which were automatically opened when the two parts of the couplings were joined and closed when the couplings were separated, so that the valve of the coupling at the end of the train was always closed and prevented the escape of air. The piston of each cylinder was attached to the ordinary hand brake lever, so that by the admission of air, the brakes were applied.

It took considerable time to apply the brakes with full force and longer to release them, and in the event of a break-in-two of a train the rear section would be uncontrolled. To overcome this difficulty a new development (1872-3) was what has since been known as the automatic air brake. The equipment was the same, with the addition of an auxiliary reservoir and a triple valve device between the brake pipe, brake cylinder and auxiliary reservoir. This triple valve, when air was admitted to the train pipe, established an opening between the train pipe and the auxiliary reservoir whereby they were filled with air under pressure. The valve also opened a passage from the brake cylinder to the atmosphere. This was the normal condition of the apparatus when the brakes were off. To apply the brakes, the engineer discharged a portion of the air from the train pipe, whereupon the triple valve closed the connection between the brake pipe and the reservoir and between the brake cylinder and the atmosphere and then opened a passage from the auxiliary reservoir, so as to apply the brakes. The restoration of the pressure within the brake pipe released the brakes and recharged the reservoir. In the event of the escape of air from the train pipe by its rupture or by the separation of the train, the air stored in the auxiliary reservoirs instantly and automatically applied the brakes to all parts of the train.

In 1885 the Master Car Builders appointed a committee to report upon the feasibility of applying brakes to freight trains, and this committee inaugurated what are now known as the Burlington (Iowa) brake trials made in 1886 and 1887. These tests proved the inadequacy of the automatic air brake then presented by the Westinghouse Air Brake Company, as well as the inadequacy of all the other brakes then tested. The lack of success was due to the comparatively slow application of the brakes upon the rear of a long train.

As a part of the automatic air brake passenger equipment, I had developed in the seventies a system of train signaling, using a second train pipe. This signaling apparatus had a sensitive valve device connected to a small reservoir upon the locomotive so arranged that when air was admitted through a small opening into the signaling pipe, both the pipe and reservoir were charged to a low pressure (at the present time 45 lb.). By opening a valve at any point in the train to exhaust a small quantity of air from the signal pipe, the delicate valve referred to was moved so as to admit air from its auxiliary reservoir to blow a whistle in the locomotive cab. It was found that when the valve in any car remote from the engine was quickly opened and closed as many as five times, the whistle would be blown an equal number of times—that is, there were set in motion five distinct waves of air, each capable of doing work. The waves of air within the brake pipe traveled as rapidly as sound—*i. e.*, about 1100 ft. a sec.

### The Quick Action Brake

The idea that if the wave of air utilized for signaling could be made to operate the triple valves upon the cars, there would then be an almost instantaneous application of the brakes upon the front, rear and other portions of the train, led to what is now known as the quick-action automatic brake. The valves as developed were successful, and tests made with them were eminently satisfactory. The wide publicity given to these tests, coupled with a public demand for the adoption of means to prevent accidents, brought about the enactment of a law by Congress obliging the railroads to apply brakes and also automatic couplers to all freight trains in the United States. The quick-action automatic brake was operated like the first automatic brake for ordinary train movements; the quick action being used only for emergency applications.

Steel freight cars carrying enormous loads, had in the meantime been developed and freight locomotives had been increased in capacity, so that trains were often composed of 70 to 80 cars, and more recently some have had as high as 100 cars. This possibility had been foreseen, and experiments carried on to so improve the apparatus, that it could be used to control trains of any practical length. These experiments also had in view the more nearly instantaneous action of the brakes for ordinary service purposes than was possible with the automatic brake or with the quick-action brake. The present improved triple valve has the emergency feature, but also what is known as the quick-service application feature; for ordinary purposes the air is admitted to all of the brake cylinders so quickly that the longest freight train can be handled with almost the precision of a 6 to 12 car passenger train.

* From the presidential address to the American Society of Mechanical Engineers, December 6, 1910.

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The blast furnace of the Clinton Iron & Steel Company, Pittsburgh, was banked December 7. The stoves are to be relined and other repairs made.

## October Exports and Imports of Iron and Steel

The exports of iron and steel increased and imports diminished in total values in October, according to the report of the Bureau of Statistics of the Department of Commerce and Labor. The value of that month's exports of iron and steel and manufactures thereof, not including iron ore, was $17,452,085, against $16,776,178 in September. The value of similar imports in October was $2,497,754, against $2,680,369 in September.

The exports of commodities for which quantities are given totaled 125,687 gross tons in October, against 106,781 tons in September, 130,877 tons in August, 128,055 tons in July, 120,596 tons in June, 135,344 tons in May, 117,918 tons in April and 124,753 tons in March. The details of the exports of such commodities for October and for the 10 months ending with October are as follows, compared with corresponding periods of the previous year:

*Exports of Iron and Steel.*

| | October, | | 10 mos. ending October, | |
|---|---|---|---|---|
| | 1910. | 1909. | 1910. | 1909 |
| | Gross tons. | Gross tons. | Gross tons. | Gross tons. |
| Pig iron | 11,229 | 7,908 | 95,091 | 48,745 |
| Scrap | 1,687 | 650 | 18,554 | 24,137 |
| Bar iron | 1,052 | 1,938 | 15,980 | 10,319 |
| Wire rods | 2,544 | 3,747 | 19,440 | 14,418 |
| Steel bars | 10,708 | 8,097 | 89,642 | 59,469 |
| Billets, blooms and plates | 15,493 | 3,928 | 29,655 | 98,522 |
| Steel rails | 19,542 | 22,036 | 283,324 | 211,820 |
| Iron sheets and plates | 7,499 | 7,309 | 84,508 | 58,262 |
| Steel sheets and plates | 14,068 | 9,228 | 141,116 | 83,099 |
| Tin and terne plates | 552 | 631 | 8,946 | 7,456 |
| Structural iron and steel | 9,942 | 6,040 | 124,494 | 74,473 |
| Wire | 7,038 | 5,298 | 74,788 | 65,344 |
| Barb wire | 8,135 | 9,357 | 62,770 | 58,504 |
| Cut nails | 1,106 | 919 | 6,477 | 7,799 |
| All other, including tacks | 925 | 416 | 8,333 | 6,253 |
| Pipe and fittings | 14,167 | 19,392 | 132,268 | 132,346 |
| Totals | 125,687 | 106,894 | 1,195,386 | 960,967 |

The imports of commodities for which quantities are given totaled 31,454 tons in October, against 30,960 tons in September, 36,878 tons in August, 42,326 tons in July, 31,010 tons in June, 45,021 tons in May, 51,438 tons in April and 57,150 tons in March. The details of the imports of such commodities for October and for the 10 months ending with October are as follows, compared with the corresponding periods of the previous year:

*Imports of Iron and Steel.*

| | October, | | 10 mos. ending October, | |
|---|---|---|---|---|
| | 1910. | 1909. | 1910. | 1909. |
| | Gross tons. | Gross tons. | Gross tons. | Gross tons. |
| Pig iron | 20,280 | 13,305 | 196,895 | 113,128 |
| Scrap | 3,393 | 11,259 | 68,850 | 25,522 |
| Bar iron | 1,668 | 2,306 | 32,879 | 13,968 |
| Billets, bars and steel forms n.e.s | 3,080 | 1,517 | 39,106 | 13,369 |
| Sheets and plates | 203 | 399 | 5,668 | 3,058 |
| Tin and terne plates | 1,669 | 4,963 | 51,006 | 49,351 |
| Wire rods | 1,161 | 967 | 16,940 | 9,514 |
| Totals | 31,454 | 34,716 | 411,344 | 227,910 |

The imports of iron ore in October were 219,571 gross tons, against 208,892 tons in September, 282,949 tons in August, 248,810 tons in July, 193,415 tons in June, 240,833 tons in May, 206,135 tons in April this year and 178,051 tons in the month of October, 1909. The total importations of iron ore for the 10 months ending with October were 2,219,488 gross tons, against 1,297,382 tons in the corresponding period of last year and 560,824 tons in the corresponding period of 1908. Of the October imports of iron ore 137,250 tons came from Cuba, 36,177 tons from Sweden, 19,729 tons from Canada, 6250 tons from Spain and 20,165 tons from other countries.

The total value of the exports of iron and steel and manufactures thereof, not including ore, for the 10 months ending with October was $164,376,387, against $128,170,458 in the corresponding period of last year. Similar imports were respectively $32,937,752 and $23,567,183.

## The Steel Corporation's Unfilled Orders

The United States Steel Corporation's report of unfilled orders on hand November 30, which was published December 10, showed a total of 2,760,413 tons, representing a falling off of 111,536 tons in November. This is the lowest total in any of the reports of tonnage the corporation has given out in the past eight years, though, as it does not include inter-company business, it is probably not as bad a report as some others in which the figures were larger—that of September 30, 1904, for example. The last statement compares with others as follows:

| | |
|---|---|
| November 30, 1910..2,760,413 | December 31, 1906..8,489,718 |
| October 31, 1910....2,871,949 | September 30, 1906..7,936,884 |
| September 30, 1910..3,158,106 | June 30, 1906.....6,809,859 |
| August 31, 1910....3,537,128 | March 31, 1906.....7,018,712 |
| July 31, 1910.....3,970,931 | December 31, 1905..7,605,086 |
| June 30, 1910.....4,257,794 | September 30, 1905..5,865,377 |
| March 31, 1910.....5,402,514 | June 30, 1905.....4,829,655 |
| December 31, 1909..5,927,031 | March 31, 1905.....5,579,560 |
| September 30, 1909..4,796,833 | December 31, 1904..4,696,203 |
| June 30, 1909.....4,057,939 | September 30, 1904..3,027,436 |
| March 31, 1909.....3,542,595 | June 30, 1904.....3,192,277 |
| December 31, 1908..3,603,527 | March 31, 1904.....4,136,961 |
| September 30, 1908..3,421,977 | December 31, 1903..3,215,123 |
| June 30, 1908.....3,313,876 | September 30, 1903..3,278,742 |
| March 31, 1908.....3,765,343 | June 30, 1903.....4,666,578 |
| December 31, 1907..4,624,552 | March 31, 1903.....5,410,719 |
| September 30, 1907..6,425,008 | December 31, 1902..5,347,523 |
| June 30, 1907.....7,603,878 | September 30, 1902..4,843,007 |
| March 31, 1907.....8,043,858 | |

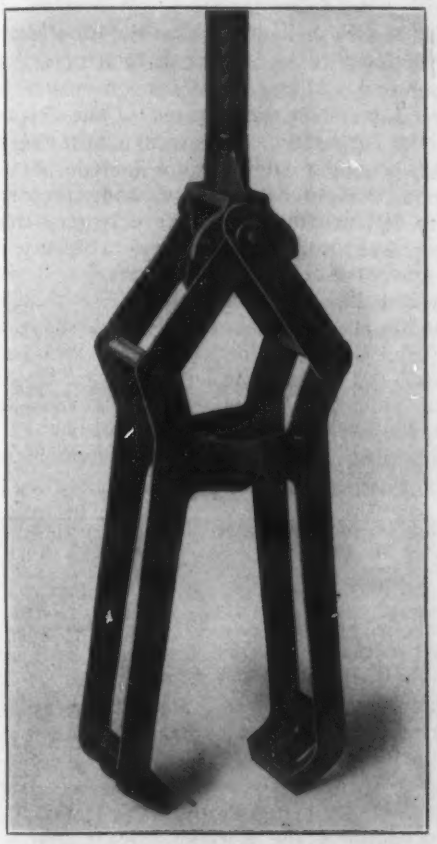
Chairman Gary of the Steel Corporation said recently that the number of men now employed by the subsidiary companies is approximately 180,000. This compares with 225,000 at the high water mark reached in 1909. He intimated that if there is a further reduction in operation the working force would be reduced in consequence, but he considered the outlook better than on August 1 last. In the month of August the daily bookings of new orders were about 20,000 tons; they rose to 21,500 in September; to 22,750 tons in October, and to 24,000 tons in November.

**The Empire Steel & Iron Company.**—At the monthly meeting of the directors of the Empire Steel & Iron Company, held at 30 Church street, New York, December 13, 1910, a dividend of 2 per cent. was declared out of earnings for the six months ending December 31, 1910, making 5 per cent. for the year. The earnings for the year were more than sufficient to pay the full dividend of 6 per cent., but owing to the depressed condition of the iron trade and the uncertain outlook for the near future it was thought wise to curtail. The company is now running on the basis of about 50 per cent. of its entire capacity, the two furnaces active being its largest, and has accumulated a small stock of pig iron. The ore mines in New Jersey are being run to their full capacity and are reported to be doing well, some sales of ore having been made to other furnace companies.

**Recent Changes in Foreign Tariffs.**—The initial number of a publication entitled "Foreign Tariff Notes" has just been issued by the Bureau of Manufactures of the Department of Commerce and Labor, Washington, D. C. The scope of the new publication is a broad one, embracing changes in rates of import and export duty in all the important countries of the world, notice of proposed or pending revisions of foreign tariffs and amendments of the customs and consular regulations. The first number covers the changes for the last five months. Future issues will be published as often as the number of items requires.

## The Whitehead Automatic Flask Bar Tucker

At the meeting of the Philadelphia Foundrymen's Association held on Wednesday evening, December 7, James Whitehead of the Abram Cox Stove Company, Philadelphia, Pa., described an automatic flask bar tucker on which he has applied for a patent. The device was designed to lessen the work of the molder



A New Automatic Flask Bar Tucker Designed by James Whitehead, Philadelphia, Pa.

in tucking the sand underneath and around the cross bars of the molds used in floor work, as the old methods were extremely hard on the molder's fingers, especially if the bars were of iron.

The tool opens and closes itself automatically, and while not heavy, possesses sufficient strength to withstand the ordinary foundry abuse without getting out of order. The wooden handle is 3 ft. 6 in. long and fits into a cast iron socket having a gauge to keep it in an upright position. Steel legs are attached to the socket and at their lower ends are the small castings which do the work of tucking or tamping the sand under the flask bars. The length of the tool from the socket to the ends of these small castings is 16 in., which makes the total overall hight 4 ft. 10 in.

Openings in the tamping castings are provided through which the sand can pass, thus eliminating all danger of a false parting being caused by the sand being pressed too firmly by the tool. A small casting with pins that is attached to the handle socket prevents the jaws from opening too far. The jaws open automatically when the tool is raised, and when pressure is exerted on the handle the legs come together by a toggle lever action and force the sand beneath the bar so that it will be sufficiently firm without being too hard and also much more uniform than when done by hand. In operation the tool permits the molder to stand erect at his work and walk over the bars if desired, thus effecting a considerable saving in time and also performing the work better than was possible by the old methods.

Arrangements have been made with the J. W. Paxson Company, Philadelphia, Pa., to manufacture and market the tool as soon as the patents are granted.

## The Goulds Combined Air and Water Cylinder for Pneumatic Pumping

For use in connection with pneumatic water systems the Goulds Mfg. Company, Seneca Falls, N. Y., has recently placed on the market a combined air and water cylinder. This can be used with any well force pump standard or working head where the stroke does not exceed 10 in. for supplying pneumatic pressure tanks from either deep or shallow wells. A sectional view of the cylinder, which shows its construction clearly, is given in Fig. 1, and Fig. 2 shows the cylinder connected to a three-way distributing force pump head.

This cylinder is intended to be attached with the connecting pipe above the water cylinder and the air forced through the same pipe that discharges the water. Its construction is such that the upper or air cylinder takes in a quantity of air equal to the difference in the displacements of the two cylinders at each stroke and at the same time pumps the air which was drawn in on the preceding stroke to the pressure tank through the regular discharge pipe. In this way the necessity of

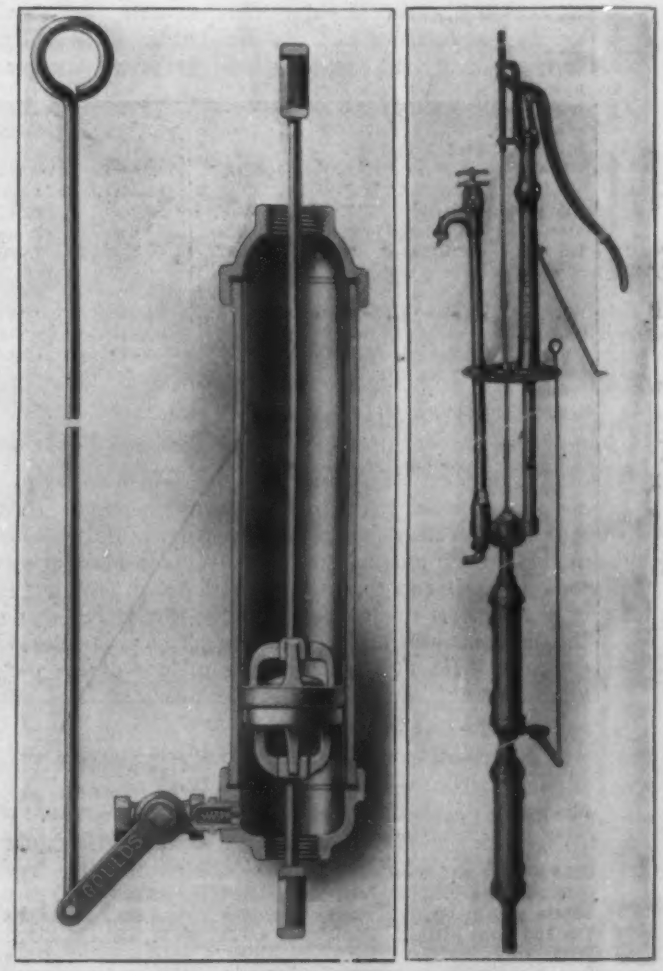



Fig. 1.—Sectional Elevation. Fig. 2.—On a Pump.
Two Views of the Combined Air and Water Cylinder Made by the Goulds Mfg. Company, Seneca Falls, N. Y.

maintaining a separate air pump to keep the required pressure in the tank is eliminated. These cylinders are made in two sizes, with diameters of 3 and 3½ in., and can be used with pumps where the diameter of the lower cylinder is either 2½ or 3 in., respectively.

The air valve at the lower end of the air cylinder has a lever and rod extending to the base of the pump standard, so that it is possible to shut off the air supply whenever it is desired. In Fig. 2 the pump is shown with the shut-off rod extending to the base of the pump. During the time the air valve is closed the capacity of the pump is equal to that of the upper cylinder.

# The Gyroscope and Its Useful Possibilities—III

## In Monorail Cars, Automobiles, Aeroplanes and Ships

BY ELMER A. SPERRY, NEW YORK.

Another very popular application of the gyroscope, and one that has been prominent of late is the monorail.

The principle that Mr. Brennan uses is not only extremely ingenious, but very interesting, and can be illustrated by the use of a hairpin and an ordinary little gyroscope top, such as is shown in Fig. 25. It depends upon the fact that if the precession be accelerated or increased it can be made to do work. If a top is spun it will stand on its point and start slowly to turn or wobble generating a cone; gravity presses it down and it is so mounted that it precesses clear around the circle. This motion is sometimes called the Newtonial motion. The top is falling all the time, and in so doing creates precession. The author found some 10 years ago that if he put a wire or rod over a spinning top and turned it as one would a crank, so as to accelerate the precessional or Newtonial motion, he could make the top instantly rise and stand upright; it would come up against gravity doing work, as in Fig. 26 where the top is raising a weight. Brennan uses this principle on his monorail. When the precession is retarded the free side of the top will go down, as in Fig. 27.

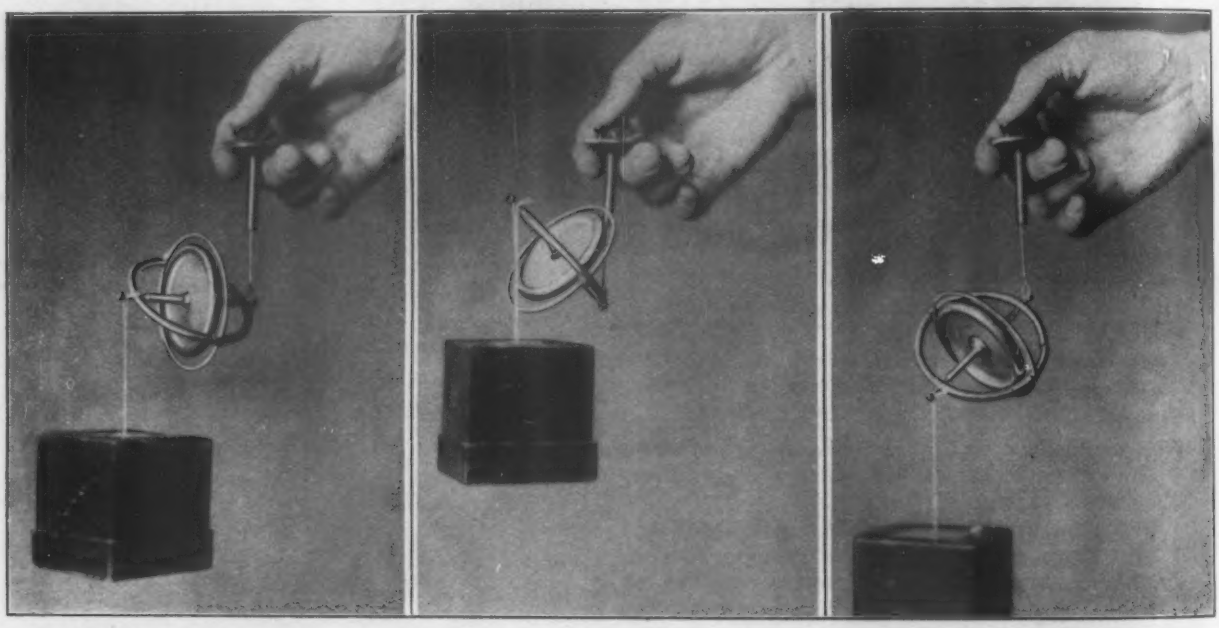


Fig. 25. Fig. 26. Fig. 27.

A Gyroscope Top Used to Demonstrate the Principle of the Brennan Monorail Car.

The Brennan monorail car has a platform mounted upon two wheels in tandem upon a single rail. In a frame erected upon the platform is pivoted upon a vertical axis a spinning mass or disk having a horizontal axis in a frame, which is pivoted upon a vertical axis and may be turned to either side by a horizontal handle. Suppose now the mass to be of considerable weight and spinning rapidly and the car in its upright position and tending to fall either one way or the other, the angular motion thus generated would cause precession, and the handle would start quickly, turning to one side or the other. This would continue until the handle swung through 90 degrees. During this swinging motion the car would have fallen in the direction in which it started only a trifling distance. After the wheel had reached its full sidewise position the car would be no longer retarded by the gyroscope and would fall clear over.

Suppose that an operator was upon this car watching the handle, and as soon as he saw it start in a given direction he would grasp the handle and push it still further in the same direction, thereby accelerating the precession. The car would be found to immediately stop falling and move in the opposite direction. Suppose it moved on in this opposite direction sufficiently to fall across the center line, it would then continue to fall in that direction. The angular motions now impressed upon the gyroscope will cause the handle to move, but the directional motion will be opposite to that first described, and if the operator in detecting this motion should again grasp the handle and push it in the same direction, the car will at once be arrested in its fall and righted until it will start to fall on the opposite side, and this operation is repeated indefinitely; the car always falling one side or the other of the center is constantly corrected and therefore never falls. This act of persisting in accelerating the precession until the car has passed over the gravitational center and starts to fall in the opposite direction is the essence of the whole problem, and Mr. Brennan has devised mechanism to perform the acts of the operator just described.

Mr. Brennan soon found that this car would not pass around curves without the use of two wheels spinning equally in opposite directions with their precessional rings coupled. This eliminated the effect of angles about a vertical axis introduced by curvature of the rails and allowed the gyroscope to respond only to the angles of horizontal axis impressed by the falling car.

The operation of the gyroscope is so powerful and so completely opposes the incipient motions of the car in either direction from the center that it is possible to accomplish the desired result in ways other than suggested by Mr. Brennan. Mr. Froelich accelerates the precession when it has once reached the center by a servo motor shown to the left in Fig. 28. The author has done some work in this field with excellent results. Much credit is due to Mr. Brennan for the thoroughness with which he has been able to carry

out the details of his work. If the disturbance of equilibrium is caused through any other impressed forces, such as weights within the car being shifted or centrifugal action of speed upon a curve, the results in reaction are identical.

The monorail has not been very well received by some engineers, but still there is a great deal to be said in favor of it. If the monorail is to come in it will probably be through the popular demand for very much easier riding at high speeds than is possible with two rails; this difference is very great. When cars become very much larger, several decks possibly, and the easy riding qualities of the monorail are understood, it may become largely used. There is no great saving in rail; the one has to be nearly as heavy as the two; there is little saving in sleepers; they have to be twice as close together; no saving in excavation or tunnels; no saving in the outlay; many of the advantages that have been urged do not seem to exist. Quick laying across the prairie of one rail and the freedom from the necessity of a straight line may render the monorail usable for war purposes.

### Other Applications of the Gyroscope

Brief mention should be made of the use of the gyroscope to establish artificial horizon in connection with observations at sea. A French firm has for some years been manufacturing an instrument for this purpose, which has met with considerable success. The spinning wheel weighs but a few ounces, is driven by compressed air, and is hung by a point above its center of gravity. The oscillations of its precession constitute an angle, and by bisecting this angle the artificial horizon is established. The speed indicated by the rapidity of the precessional oscillations is also taken into account in final determinations.

Another use of the gyroscope which promises to be important is in connection with automobiles. The car body of an automobile has two definite series of oscillations; the slower one being longitudinal to the body —*i. e.*, the back end of the body will oscillate about the forward axle as a center or the forward end will oscillate about the rear axle as a center. The body also has a quick sidewise vibration about its own longitudinal axis, which renders long continued riding extremely tiresome, if not injurious, to passengers. These vibrations are set up by one wheel of the rear axle rising over an obstruction or falling into a depression, and it is this vibration that is considerably relieved by pneumatic tires. It has been definitely ascertained that by the use of a comparatively small gyroscope, these sidewise vibrations can be entirely suppressed. Only an occasional very large impulse from one end or the other of the axles reaches the body, the gyroscope suppressing all ordinary vibration in this plane. It is thus seen that the gyroscope in this capacity operates to allow the body only a vibration of long period and about the transverse axis which is very natural and easy on the occupants.

Mr. Churchward, a recognized authority in automobile engineering, has stated that with the suppression of sidewise vibration which the gyroscope is found to accomplish, pneumatic tires become unnecessary. In other words, the particular advantage obtained through the pneumatic tire is thus very largely done away with. The gyroscope makes it practically impossible to quickly upset the vehicle, affording in this way greatly increased security to the occupants. The specification in this attachment of the gyroscope provides simply that it should be mounted under the body and above the spring base of the vehicle. From facts gathered in this connection, it is found that only a very small amount of power is required to spin the gyroscope wheel. Fig. 29 represents such an arrangement, but the gyro wheel in this particular case was found to be many times heavier than necessary.

The use with aeroplanes is of growing importance. It has been shown that even with an extremely small gyroscope a very large balancing factor is introduced on the monorail car. An aeroplane with a very low metacentric hight is the only one that seems practical at present, but such a machine is not stable. One with a low center of gravity is very stable and safe, but owing to the large metacentric hight, will swing vigorously. It absolutely cannot swing, however, if a gyroscope is employed, properly mounted. The experiment with the stool and lead tired bicycle wheel (page 1323, Figs. 16 to 20) showed that a powerful fulcrum can be produced in space by the use of the gyroscope. With a comparatively light gyro the swing will be extremely slow—several seconds possibly being employed in the oscillation—a long time can thus be given the operator to make his correction, thus greatly relieving him of nervous strain. That is one of the points that Mr. Wright makes as a result of his experience. The quickness and unerring adjustments required make the aeroplane problematical in ordinary hands. The public is beginning to recognize that with unaided control, as in the case with the present machines, their successful manipulation classes too much as an acrobatic feat, and many hesitate to trust their proficiency in this field or engage in so nerve racking an occupation. It may be possible that the difficulty can be entirely overcome by the use of a gyroscope.

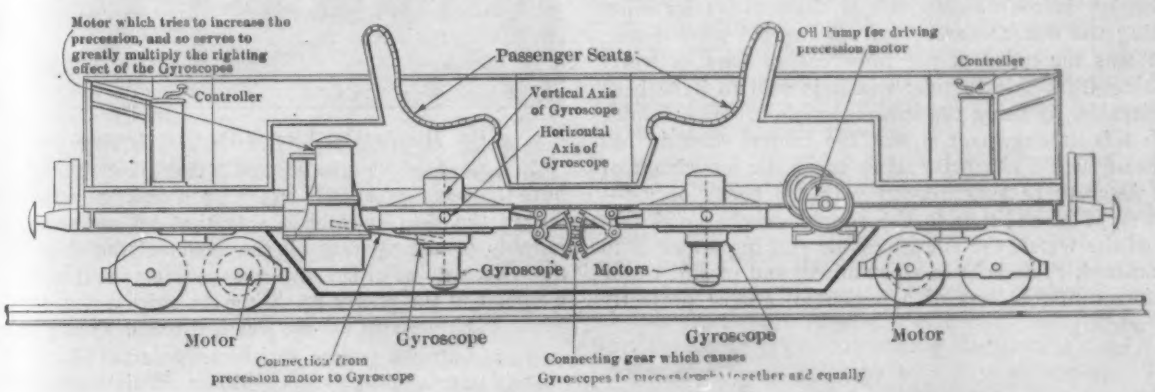



Fig. 28.—The Froelich Monorail Car.

The author has a gyroscope on an aeroplane that has been in the air a number of times, with extremely satisfactory results. A small gyroscope is wonderfully powerful as compared with its size and weight. Ten pounds at the radius of a foot will develop stresses of 1 ton at this radius and may be either directed or projected as required. In Figs. 30 and 31 the gyroscope is shown at G, and is driven from the engine and requires about the same power as two incandescent lamps to drive it and runs nearly two hours after the power is cut off or stops for any reason.

### Gravitational Steadying of Ships

Volumes have been written upon the rolling of ships and the problem has been attacked in a great many ways. Frude tried to accomplish it by the use of

water chambers placed athwartship. When the ship rolled the water would rush from one side to the other, in that way extinguishing part of the roll. Those who have experienced heavy rolling know how grateful would be even a small diminution in the roll.

Bilge keels have been introduced, and their characteristics have been quite well understood, being effective only in heaviest rolling, as has been shown by tests made on full sized ships and checked by experimental tank tests. Quite large bilge keels were found to equal about three-fourths of the surface, hull and keel action for all angles of roll. The comparisons between bilge keels and 1 per cent. of water ballast in athwartship tanks is interesting. Very large keels were found to be only one-eighth as effective at 3-degree roll from the vertical, one-fourth as effective at 5-degree roll, only equaling at 12-degree roll, and being three times as effective at 18-degree roll. They are also known to increase materially the resistance (skin friction) and motive power required in all weathers. Bilge keels depend upon the relative movement through the water for their efficiency just as one would expect. Power is required to drag them through the water at all times in calm as well as when needed, whereas with the gyroscope all one has to do is to start it up whenever need exists.

In Germany the author met Dr. Frahm, who has succeeded in overcoming one of the reasons for eliminating the water chambers from the old men-of-war, that was the noise of the hundreds of tons of water rushing from side to side, which is said to have been intolerable, by using the inverted siphon. The trouble with this arrangement is that the central opening has to be of such a character as to cause the movement of the water to be synchronous with the boat's period—that is, if in addition to the simple gravitational factor of the water, the energy of the rushing water is to be utilized. The boat is a pendulum, and in still water conforms to the laws of a pendulum almost perfectly as to uniform period. The movement of the water in the arrangement can be made to conform to some given period. In rough seas, however, the boat is not periodic, varying a great deal. The author has seen autographic records of rolling where the period varied from 7 to 17 seconds. Naturally, when the flow of this great quantity of water gets out of synchronism it becomes a menace, and makes the boat roll more and behave worse.

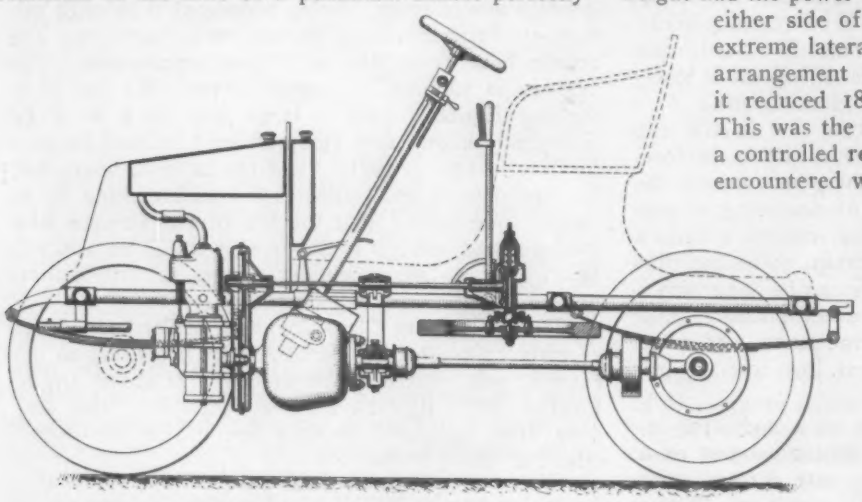


Fig. 29.—A Gyroscope Applied to Suppress Vibration in an Automobile.

The great engineer, John I. Thornycroft, of England, tried to overcome the last named difficulty. He placed a great moving weight on a vertical axis in the hold of a ship (by this means the center of gravity of the ship could be changed at will), and also an equipment of hydraulic apparatus for swinging this weight from side to side. The weight was about 5 per cent. of the total displacement of the ship,

Fig. 30.—An Aeroplane Fitted with a Stabilizing Gyroscope.

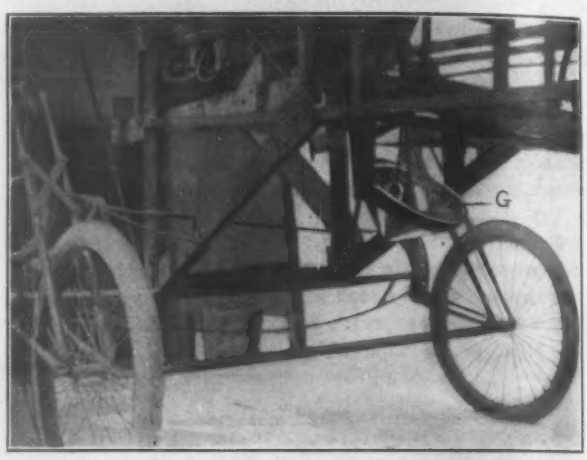



Fig. 31.—Another View of the Gyro Aeroplane.

but it was governed by a controlling apparatus within the ship, in such a way that he succeeded admirably in anticipating all the needs of the ship up to the capacity afforded by this moving weight. The weight had the power of tilting the ship just 2 degrees either side of the vertical when swung to its extreme lateral positions. In sea trials of this arrangement Sir William White states that it reduced 18 degrees of roll to 9 degrees. This was the first attempt to steady a ship by a controlled reactionary force. The difficulties encountered with this, the water tanks and all other gravitational methods is that each pound of weight is enabled to do the work of only 1 lb., and the weights and auxiliary machinery required have been found to be prohibitive; furthermore, the weight when on one side or the other constitutes a persistent unbalancing or listing force whereas the gyroscope delivers stresses pure and simple without disturbing the balance of the boat or introducing any such list whatever. The problem of preventing rolling of ships at sea has been attacked by a great many engineers.

A year ago last summer, while in Hamburg, Germany, the author saw the latest arrangement of Frahm. Three large vessels for the Russian Government are now being built with his arrangement for steadying ships, involving enormous tanks amidships, which will contain from 350 to 400 tons of water through the rushing of which, back and forth, a part of the true periodic roll will be extinguished, but only a part and only when periodic. Dr. Schlick states with reference to this arrangement that it will become a positive menace and cause excessive rolling when the ship's oscillation falls out of period which it invariably does in a storm. This, however, is interesting, as showing the great desire to prevent rolling of ships.

### Gyroscopic Steadying of Ships

The gyroscope, on the other hand, is not limited to any particular period of the boat; it simply responds to whatever motion the ship has, synchronous or non-synchronous. The question is often asked, Why is the gyroscope better than a moving weight in a ship for roll quenching? The reason is perfectly apparent when you recall the magnitude of stress obtainable from a small machine. Every pound in the rotating mass of the gyroscope can easily be made to do the work of from 150 to 200 lb., and direct in any desired line or plane whereas, when water is used or any other form of moving weight, each pound represents only a pound, and can do the work of only a pound. The small amount of power required for operating a gyroscope is emphasized by the fact that it is small as compared with the extra power required to drive a vessel fitted with bilge keels. One instance has been noted where the power required for operating the gyroscope would be about 5 per cent. of that excess required for bilge keels at normal speed of the boat. Moreover, the keels require power in all weathers, the gyroscope only when needed.

The gyroscope is probably the only device in the world by means of which stresses and also energy may be transferred "around a corner," so to speak. With the gyroscope it is possible to create and maintain a very powerful fulcrum in space effective for the heaviest kind of mechanical duty.

A couple of years ago in the navy yard at Washington the author had some models which were being inspected then and afterward were taken to the Navy Department near the White House. Among the men who came in to pack and take them was an old sailor, who wanted to know what it was. Upon being told that it was a device for preventing the rolling of ships at sea, he said, with a rather decisive wag: "You cannot stop a ship from rolling in the middle of the ocean; why, what are you going to get hold of to steady her?" In a way he was right. A great mass like a ship cannot be prevented from rolling unless it is possible to lay hold of something and something extremely stiff.

On board ship there is one factor that is stiff, and is now available for this purpose, and that is the fore-and-aft stability of the ship. In the gyroscope for the first time the means is at hand of rendering it possible to reach out and transfer this stability around a corner, so to speak, to the athwartships plane and thus hold the ship against rolling. This can be done with a surprisingly small mass, because every pound in that mass can be made to do a very large amount of work, owing to the velocity that may, at low cost, be impressed upon it.

A primary motion on the part of a body, for instance, the slow athwartship or rolling motion of a ship exerts gyroscopic forces upon any vertical spinning shaft and in a fore-and-aft direction. These forces tend to dampen the rolling motion but only feebly, and the fore-and-aft reaction owing to the absence of motion does not at all. It is a part of the general plan to so utilize this force as to make it create extremely large reactions athwartships or in the proper direction to be effective. This is accomplished by the ingenious yet simple expedient of mounting the vertical shaft in a pivoted frame, so that it can tilt and utilize the primary fore-and-aft reaction to cause the axis of the spinning mass to tilt fore and aft. This motion is of much higher velocity than the angular motion of the vessel which produces it. By means of this tilting motion an entirely new gyroscopic force is set up, again at right angles as in the first instance, but now to the plane of tilt (fore and aft) which brings it back to the original athwartship plane just where needed, and what is equally important the reaction is in a direction exactly opposed to the roll of the ship which primarily called it into action; and, in fact, this whole train of phenomena, which has thus been traced through a complete cycle of 180 degrees, produces an enormous augumentation of righting movement and stabilizing power.

*(To be continued.)*

## An Unusual Gas Producer Installation

About a year ago the Fostoria Glass Company, Moundsville, W. Va., installed two Amsler gas producers to furnish gas to its 12-pot furnace. This furnace is a deep-eye construction, being fired with natural gas at the time. The product is table ware. The method of burning the gas is a departure from the usual practice, as the gas and air are not regenerated, but the gas is taken from the producers and fired directly in the furnace, while the air is supplied through passages already in the furnace and proper adjusting doors.

There was some doubt expressed as to the feasibility of the scheme, and it seemed reasonable to expect that there would be some difficulty in securing and maintaining sufficiently high temperatures to properly melt the sand and other material in the batch. When the producers were ready, the gas was turned into the furnace and the natural gas shut off, as there was no change made in the furnace that could not be made from the outside. It took several days for the operatives to get used to the producer gas, and the outcome was rather doubtful for some time. Presently the proper adjustment of the gas and air was found, and there was no further trouble.

In placing an order for five additional producers, the company gives the best recommendation of the plant already installed. The new producers are to operate the 14 and 16-pot furnaces. At the time of placing the order, the company expressed itself as follows: "We are using gas from these producers in an entirely new manner, having connected them with our deep-eye furnace without leaving the furnace out. The results have been fully up to our expectations. The furnace is running on natural draft. We use it in melting Hancock sand in large pots, 46 x 60 x 54. Everybody knows that Hancock sand is hard to melt, but this furnace is melting in from 22 to 24 hours, and we can depend on it the week round melting in 24 hours. We believe that the life of our furnace with producer gas, using it in the manner which we are, will be as long or longer without repairs as with natural gas for fuel."

The Millersburg Glass Company, Millersburg, Ohio, recently contracted for three Amsler producers to operate its pot furnace in the same way as above, and to furnish gas to its tank furnace, lehrs, &c. This was done after a careful investigation of the results attained at Moundsville.

In a recent installation of Amsler gas producers for the Reading Iron Company, Reading, Pa., a two-unit plant is being operated to make gas for a 500-hp. engine. The gas in this case is made of bituminous coal and scrubbed to contain not over 0.015 grain of solids per cubic foot. The scrubbing devices consist of a water sprayed cooling tower and wet scrubber, a rotary or centrifugal scrubber, and a purifier for removing sulphur. A small storage tank is provided for equalizing the gas.

The contract of the American Steel Foundries with its officers, under which they were to receive a share in the profits above a fixed sum, expired July 31, having run for five years. A new contract for two years, beginning August 1, 1910, has been made, which it is stated will be more advantageous to the company and its stockholders than the first one. The company is operating at about 60 per cent. of capacity, and has a month or six weeks' orders on hands.

# The Mechanical Engineers' Convention

## Thirty-first Annual Meeting, New York, December 6 to 9, 1910

In many respects the annual meeting of the American Society of Mechanical Engineers, just closed, was one of the most successful in its career. The attendance was especially large, the total registration being 1043, of which 633 were members and 410 guests; the papers presented at the professional sessions were well selected in the subjects covered and brought out considerable discussion, and the social features of the programme could hardly have been made more enjoyable. A fact commented on by many was the more than ordinarily cordial atmosphere that existed; even the strangers and those who most seldom attend felt this spirit of hospitality. To a great extent this was due to the efforts of the subcommittees on acquaintanceship, which were a new institution in the provisions for entertaining. The presence also of quite a number of those who attended the meeting in England last summer, and had pleasant experiences to recall in their reunion, contributed to the general feeling of good fellowship which prevailed.

This year the entire day Friday was given up to excursions, and none of the scheduled ones took place either during or on the same day with the professional sessions. There were, however, a number of additional excursions which could be taken on any day by those who cared to omit any of the various professional sessions. Another innovation was having the president's reception on the opening evening, Tuesday, and the dance a separate affair, on Wednesday instead of Thursday evening. This left Thursday evening for a lecture, in which the National Society for the Promotion of Industrial Education, the American Institute of Electrical Engineers and the American Institute of Mining Engineers co-operated. The address by Dr. Georg G. Kerschensteiner, superintendent of schools of Munich, brought out some very interesting features in the conduct of the industrial continuation schools of Munich and was illustrated with lantern slides. All of the social features of the meeting were extremely well handled by the entertaining committees, who deserve the highest credit for the efficient work done in the preparation for them.

The papers which were of the most general interest were the presidential address, referred to in another part of this issue, which gave such an interesting account of the history of the conception and development of the air brake by George Westinghouse; the paper on the "Transmission of Heat in Surface Condensation," by George A. Orrok; the three papers on grinding presented in the session devoted to machine shop matters, and the paper presented before the Gas Power Section describing the gas engine installation in the Lackawanna Steel Works, which was the first large one in this country. A note of sadness, in connection with the latter, was the death of the author only a few days before its presentation.

### SECOND SESSION

As usual matters of business were taken up in the fore part of the first professional session. Secretary Calvin W. Rice presented the report of the tellers on the election of new members; in the last year there have been taken in 276 new members and 30 have been promoted. These include 135 full members, 28 associate members promoted to full membership, 15 new associate members, 2 junior members promoted to associate membership and 126 new junior members.

A report of the Committee on the Raising of Funds for the Land Debt was presented by Worcester R. Warner, who stated that there has now been subscribed about $226,000, leaving from $85,000 to $90,000 yet to be raised. A report of the Committee on Constitution and By-Laws was presented by Past President Jesse M. Smith, who briefly described an amendment of the constitution, which will be necessary in order to properly confer the title in the Engineering Societies Building shared by the American Society of Mechanical Engineers. This amendment was put to ballot at this meeting and carried.

Prof. Edwin Robinson of the University of Vermont presented the need in this country for a museum of engineering to correspond to such as now exists in other countries, and urged that the society give attention to the proper way in which such a museum might be established. The subject was discussed by President-elect Colonel Meier, Harrington Emerson, Secretary Rice and Fred R. Low, in the course of which it was brought out that there is now a movement on foot to establish such a museum at Washington.

Colonel Meier, presiding at this session, referred appreciatively to the address of President Westinghouse on the night before and the very desirable addition it makes to the history of engineering, and more particularly the records of the society, in recounting the birth of that important invention, the air brake. A resolution of condolence on the death of William H. Bryan of St. Louis was passed.

Prof. John A. Brashear told a little of the work of the Carnegie Technical Schools and made an appeal for the support of the individual members of the society in the great work this school is doing in the promotion of industrial education.

Reports on the meeting in England last summer were presented by Honorary Secretary Prof. F .R. Hutton and Secretary Calvin W. Rice. The latter's paper, which had been printed and distributed to the membership, contains a very complete record of the events of that meeting, a list of those in attendance and an attractive collection of photographs selected from those taken by various members, making altogether a very splendid souvenir of the meeting for those who did attend and a valuable report for all others of just what transpired. An abstract of this paper follows:

### The Joint Meeting in England

BY CALVIN W. RICE, SECRETARY.

The invitation for the joint meeting of the American Society of Mechanical Engineers and the Institution of Mechanical Engineers was received in September, 1909, and on July 16, 1910, the official party of 144 members and guests sailed from New York on the White Star steamer Celtic. There were numerous entertainments on the voyage over and the port of Liverpool was reached on the evening of July 24. Here the party was welcomed by the officials of the Institution of Mechanical Engineers, and the next morning the party disembarked and proceeded by train to Birmingham, where the meeting formally opened on Tuesday, July 26, in the hall of the British and Midland Institute. After the speeches of welcome were made and responded to, professional papers were read and discussed by members of both societies. The mornings of both Tuesday and Wednesday were devoted to professional sessions, while the afternoons and evenings were given over to excursions to points of interest and social functions. Thursday was devoted entirely to sightseeing, and in the evening a *conversazione* was given in the Institute House of the Civil Engineers in London, where the concluding sessions were held on Friday and Saturday. As was the case with the earlier sessions, the afternoon and evening of Friday were left open for excursions and entertainments, while Saturday was devoted to all-day excursions. On Sunday the official party visited Westminster Abbey, and the following day the party disbanded.

James M. Dodge, chairman of the Committee on Public Relations, reported that some progress has been made, although much still remained to be done, and

asked that the membership generally co-operate with the committee in offering suggestions, &c.

Prof. F. R. Hutton extended a cordial invitation to all the members and guests to visit the Museum of Safety, which he felt certain would be of interest to them especially on account of the work that has been done to prevent accidents in mechanical plants.

### The Transmission of Heat in Surface Condensation

BY GEORGE A. ORROK, NEW YORK.

The condenser has from the very first been an important part of the machinery designed for utilizing steam, but the advent of the surface condenser has complicated the problem until there are at the present time four opinions as to heat transmission through metallic surfaces. While these differences of opinion were not serious with small condensers, the advent of the steam turbine has developed the necessity for condensers having a capacity of 200,000 lb. of steam at an absolute pressure of 1 lb. To determine the heat transfer through various kinds of tubes and the laws governing its variation under different conditions of temperature, pressure and velocity, a series of tests were made by the author. A small surface condenser was constructed with a relatively small cooling surface and it was operated under conditions as nearly like actual practice as possible, while it was possible to vary existing conditions so that any desired vacuum, velocity of circulating water and mean temperature difference could be maintained and any one of these conditions varied throughout a considerable range independently of the others. The first tests made showed variations of as much as 20 per cent. for the same tube under the same conditions. It was decided that the difficulty must lie with the quality of the steam, velocity of the steam, air leakage or cleanliness of the tubes. These were all remedied and another set of tests made with varying vacua. Tests were next made to determine the variation of heat transfer with temperature difference, the variation with the velocity of the circulating water, the variation with the velocity of steam and the effect of the presence of air in the steam upon the heat transfer. The results of these tests showed that the coefficient of heat transfer is inversely proportional to the eighth root of the mean temperature difference, is approximately proportional to the square root of the velocity of the cooling water and is independent of the vacuum and the velocity of the steam in the condenser tubes. Air has a very pronounced effect upon the heat transfer, especially at high vacua, as has also the material and condition of the tubes.

The author in his opening remarks regretted that he had not been able to determine the law of temperature rise in condensing water, but said that to do this would have necessitated the introduction into the condenser tube of electric couples about every 4 ft. and he did not know of any way to do this. However, he believed that the results would have been the same.

Prof. W. F. M. Goss, in opening the discussion, commended the paper as one of extreme value and said that in his opinion there was no more prolific field for study existing to-day than that of heat transfer. He also thought that the time was at hand for engineers to enlarge their conception of the possibilities of a unit area of heat transmitting surface.

Prof. W. D. Ennis concurred with Professor Goss as to the value of the paper, saying that it was a noteworthy one and was an analysis of an important question. In response to his request as to how the rate of flow compared with condenser practice, Mr. Orrok said that it was within the limits of present day standard condenser practice. Continuing, Professor Ennis said that the value of the coefficient of heat transmission in relation to the mean temperature difference was surprising. He noted that the author had based the rate of transfer on the value of the outside surface of the tube, and said that he would have liked to have had the data on the relation of the thickness of the tube to the rate of heat transfer. The scattering of the points through which the various curves were drawn should not be due to the presence of air in the steam and in his opinion there was evidence of an error between the points and the curves, which was probably due to observation or operation. He was skeptical of the value of water meter readings for this class of work and preferred to weigh the water used.

Prof. Wm. Kent was especially impressed with the method followed by the author in presenting his paper. He was, however, puzzled by the expression "mean temperature difference" and asked if the arithmetical mean temperature difference which is the usual one, was meant or if it was the logarithmic or some other mean. In reply Mr. Orrok said that the mean temperature difference was the mean of the arithmetic and logarithmic means and depended entirely on the conditions that were assumed to exist in each particular case.

H. H. Suplee considered the question of air leakage important, and especially the location of the air. The air in the steam tended to cling to the surface of the tube and as a result the outside of the tube was covered with air bubbles, which formed a nonconducting jacket and retarded condensation.

T. C. McBride said that condensers now form so large a part of central station equipment that the paper was an important one. The conditions encountered in the first series of tests were the same as those met with in low pressure steam turbine practice, and the results of these tests were important. He thought that if the partial air pressure was ¼ in. of mercury the results could hardly be considered as applying to practical conditions in surface condensers. Assuming that ¼ in. was the air pressure, the effective displacement ratio of the air and boiler feed pumps he calculated would vary from 2033 to 5060, which is prohibitive. He was of the opinion that the amount of air present was much less than the author thought. He expressed the hope that the author would make some measurement of the dry pump discharge and present the results at a future meeting, as he does not know of any ever published. In conclusion, he recommended the adoption of a standard code for condenser testing.

In his closing remarks the author said that he did not think that tube thickness was very important. The majority of the tubes used were No. 18 gauge, but some were No. 16 and No. 20, and he could not detect any difference in the transference of heat, a condition which he attributed to the air in the steam. The variation between the points and the curves which Professor Ennis had called attention to was great, but nevertheless was smaller than could be otherwise obtained. The exhaust steam used in making the tests was taken from an exhaust main connected to various pieces of apparatus around the central station where the tests were run and was likely to contain air, and he also thought that some air came in through the pores in the pipes.

## THIRD SESSION

The afternoon was devoted to a consideration of five papers dealing with steam engineering topics. The first paper presented was

### Combustion and Boiler Efficiency

BY EDW. A. UEHLING, PASSAIC, N. J.

The boiler house possesses more room for economy than any other part of the plant. A properly designed steam engine will give the maximum economy, but this cannot be decreased or increased by the attendant as it depends upon a number of complex conditions. The loss of heat energy in flue gases may vary all the way from 15 to 40 per cent. and is made up of two factors, the heat of the gas itself and the heat of the combustible it contains. The former varies directly as the stack temperature and inversely as the percentage of $CO_2$, while the latter is independent of the stack temperature and varies inversely as the percentage of $CO_2$. In fact, the only loss independent of this percentage is that due to the moisture contained in the fuel, but this depends upon the stack temperature, so that this factor and the amount of carbon dioxide present in the flue gas are the two controlling factors. Stack temperature cannot be depended upon alone as an index to the efficiency of operation, and it therefore follows that the other factor must be the true measure of the operation of the plant. As both of these components are easily determined there is no reason why care should not be exercised in the selection and consumption of fuel. A full analysis of the flue gases should be made daily, and once the most economical value of $CO_2$ has been determined this component of the flue gas will serve as a guide for the fireman. A continuous automatic record is of value to the engineer, and if the stack temperature is indicated and recorded for the benefit of both the maximum efficiency can be secured with little difficulty.

This paper was presented nearly in its entirety by the author, after which the secretary read a written discussion submitted by O. H. Bathgate. In his opinion, although little exception can be taken to any of the author's statements, several important factors necessary for conclusions were either omitted or not given their proper value. Approximate analysis of coal is insufficient, and a separate determination of sulphur is necessary to associate the quality of the coal with efficient steam generation. In daily practice where the carbon dioxide is likely to be below 12 or 13 per cent. the omission of the remaining gas constituents is not serious. In addition to determining the carbon dioxide either manually or automatically means should be also provided for determining the carbon in the ash, as gas and ash analyses are essential to complete knowledge of combustion. Inconsistent results were to be expected as corrections were not made to the basis of standard fuel, temperature, &c., and if fewer results had been used and these few corrected, more reliable conclusions could have been derived. It would be especially interesting to know the ratio of available hydrogen to carbon in the fuel and the conditions for firing from which the results of some of the tables were made. It is extremely probable that the variable conditions affecting the total of the oxygen components have more to do with the inconsistent results than inaccurate analyzing. At present, he declared, there is no practical automatic carbon dioxide recording apparatus available for continuous boiler room operation. In conclusion, he recommended that a single boiler be run on a continuous test under strictly operating conditions, noting the quantities of steam generated and coal consumed, and recording all conditions entering into the operation The use of continuous gas sampling vessels, coal and water meters and steam, water and gas temperature recorders would give numerous records covering any desired period of time, and the results would determine the conditions necessary to secure the highest boiler and furnace efficiency. The carbon dioxide indicator and recorder would be useful then as an index of comparative operations, and of material value only so long as the quality of coal and other controlling factors remain essentially the same.

Prof. W. D. Ennis remarked as one special feature of the paper the complete presentation in the appendix of the modifying factors not usually considered. The whole subject, he declared, is of vital importance to power plants. The percentage of carbon dioxide is a matter of air leakage. The percentage of oxygen is difficult to measure, while stratification in the furnace results in both carbon dioxide and oxygen being present in varying percentages, depending upon where the sample is taken, and might lead to incorrect conclusions. It is not enough to measure the carbon dioxide; both that and the oxygen should be measured. The percentage of carbon dioxide is not necessarily low for maximum economy, but might be very high, although the increase in efficiency from raising the percentage of dioxide from 4 to 5 is six and one-half times that when the change from 11 to 12 is made. In his experience piping has caused trouble with a carbon dioxide recorder due to the formation of iron sulphate in the pipes when the coal contained sulphur, and in a number of cases the time required for the gas to reach the instrument was so long as to constitute a very serious objection. The ideal recorder should indicate as well as record, be cheap and so constructed that its indications cannot be falsified by the fireman.

Prof. Wm. Kent said that while steam and water gauges are essential, addition gauges for measuring the stack and furnace temperatures and the percentage of carbon dioxide are desirable. He recommended the use of a recording instrument for measuring the furnace temperature, preferably a pyrometer in conjunction with a recording thermometer, as that combination furnishes the best indicator of economy. The best economy is obtained with dry coal. He thought that too much stress is laid nowadays on the heat unit question and said that the semibituminous coals of the United States are so uniform that to assume a value of 14,500 B.t.u. per pound is better than having each particular fuel analyzed. The only constituents of anthracite coal that require analysis to determine their percentage are moisture and ash, and these can be determined without such a process, but an analysis must be made for all bituminous coals. In conclusion, he advocated the keeping of continuous records of the percentage of carbon dioxide and the boiler temperature.

Prof. D. S. Jacobus emphasized the fact that the important thing is the proportion of carbon dioxide. He also declared that there are other sources where losses or gains may be made in a boiler room; that in general there are two problems, one in connection with a plant which operates on a practically constant load and the other where the load is fluctuating and it is necessary to have enough boiler power to carry over the peak. Good firing is a very important desideratum in preparing boilers to carry the peak load and is more important than any other factor of economy.

H. C. Abell, New York, declared that in most cases the hydrocarbons are not being properly burned. In 1½ cu. ft. of marsh gas escaping up the flue 10 per cent. of the heat value of the coal can be lost, and he has found that a large percentage of the heat losses are due to escaping hydrocarbons.

J. C. Parker gave it as his experience in going through power plants that carbon dioxide recorders are usually out of order; that as at present built they are more in the nature of laboratory devices than really useful instruments for boiler rooms. High carbon dioxide does not necessarily mean high efficiency, and he maintained that a statement to the contrary in the paper is not proved.

A. W. K. Billings remarked that sight should not be lost of the fact that efficiency of combustion is not the main point, but economy of the plant. It is possible to get a high carbon dioxide record on a recorder without having proper operation. He feels that there is a field for a much more practical test than that for carbon dioxide and that there should be some means of watching how the fireman handles his fuel bed.

### Automatic Control of Condensing Water

BY B. VIOLA, BROOKLYN, N. Y.

Condensers for vacuum plants use the cooling water during its progress through the condenser, as the cooling surface and at times the injection of cooling water is unnecessarily increased by incorrect operation of the plant. The finer the division of the cooling water the more the gases pass through it and to a greater extent will the escape of the entrained air be facilitated. This division, however, is never fine enough and a proper utilization of the cooling surface can only be had by allowing sufficient time of contact. Plants constructed strictly in accordance with this plan would, however, be too large, and as water and gases are poor heat conductors when at rest some motion must be provided for the water. Therefore to heat condensed water quickly to the necessary temperature by direct contact with the steam the cooling water surface must be large and change quickly and the time of contact between the steam and the water must be as long as possible. A barometric counter current condenser will fulfill these conditions and a description of a condenser of this type designed for use with two or more vacuum pans is given in the paper. This type of condenser will perform all this work satisfactorily and very economically, particularly if some automatic controlling device operated by the temperature changes of the condensing water is applied to it. While it requires considerable water the use of a controlling device prevents waste, and in many cases where salt water is now used for condensing purposes, because of the great quantity required, the author believes that with a well constructed counter current condenser operated with a temperature controller fresh water could be used with a water purifier to remove matter carried over by the condensed water. This arrangement is a decided advantage where the condensed water can be used for boiler feed.

In presenting the paper in abstract the author used lantern slides reproducing autographic records of temperatures to illustrate his points, and emphasized the

fact that if the water is colder than it ought to be the highest vacuum will not be obtained in the condenser.

George Dinkel criticised the paper as lacking in showing any results and referred to a paper presented by John Webster at an earlier meeting on the same subject as contradicting some of the statements made in the present paper. Results have shown that a surface condenser will require from 12 to 14 lb. of cooling water for a given condensing effect, where a spray condenser will require from 20 to 22 lb. He believed that the author should be asked to append more in the nature of results to his paper.

Written discussion on the paper was presented by Mr. Shellcross, who referred to a controller that he had installed similar to the one described by the author and illustrated in his paper. It worked well and was a big improvement over their former hand control, but they were not satisfied with the wide variations in the temperature chart because the apparatus did not operate quickly enough. They observed that the temperature of air coming from the top of the condenser to the vacuum pump bore a uniform relation to the cooling water in the leg pipe, and that the temperature at the top of the condenser felt much more quickly the opening and shutting of the water valve. They therefore removed the temperature controller from the leg pipe and connected it to the air outlet pipe, with the result that conditions were considerably improved, although there were still variations due to complete opening and closing of the water supply pipe valve. This in turn was overcome by by-passing part of the water around the diaphragm valve, allowing some to enter the condenser all the time and the diaphragm valve to admit just enough to completely condense the steam. These same modifications, he believed, would improve the author's apparatus.

E. D. Dreyfus questioned whether apparatus of the kind referred to in the paper would be sensitive enough for fluctuating loads on turbines. The discussion of the paper was closed briefly by the author.

### Tests of a 10,000-Kw. Steam Turbine

BY SAM. L. NAPHTALY, SAN FRANCISCO, CAL.

The results of steam economy tests made on a 10-000-kw. turbo-generator unit under operating loads at the plant of the City Electric Company, San Francisco, Cal., are given in this paper. The object of the tests was to determine the general steam consumption of the turbine under ordinary operating conditions, and also to determine whether the builder's guarantee of economy, generator temperature, &c., had been complied with. The special features of the turbine—which was of the double flow type—the condenser and the generator are given, and this is followed by details of seven tests made on the turbine after its installation and the steam consumption test, together with a description of the apparatus used. As the operating conditions specified in the contract could not be maintained throughout the test, correction factors for superheat, steam pressure and vacuum had to be introduced. The conditions during the test and the results obtained are shown on several diagrams, and a table gives the results on the basis of water rate and the Rankine cycle and thermal efficiencies. Two special features of interest in the turbine are the employment of a new principle in oil relay operation of the main valves and the high speed of rotation—1800 rev. per min.

In the absence of the author this paper was presented by A. W. K. Billings, who added a few remarks on the conditions of the test. For one thing, they were unable to get full loads on the machine except when the fluctuations were very large.

### Test of a 9000-Kw. Turbo-Generator Set

BY F. H. VARNEY, SAN FRANCISCO, CAL.

Prior to 1908 the city of Oakland, Cal., was dependent upon water power stations and transmission lines varying from 125 to 150 miles in length for its electrical energy. At that time it became evident that this service must be bettered, not only on account of the capacity but also for the regulation. A turbo-generator set was decided upon as offering the best solution of the problem, and in 171 days from the beginning of the plans for the equipment it was built, erected and placed in successful operation. The turbine is operated in parallel with the hydroelectric system, which consists of 11 water power stations, 3 reciprocating engine stations and 1 gas engine plant. Since its installation it has operated perfectly in every particular, and speedily demonstrated its superiority over reciprocating steam or gas engines, both in regulation or maintenance. The apparatus installed consists of a 9000-kw. vertical Curtis turbo-generator, a Worthington condenser and vacuum pumps, and eight 754-hp. water tube boilers equipped with oil burners of the back-shot type and superheaters for 100 degrees superheat. The guaranteed efficiency at full load and unity power factor, with a steam pressure of 175 lb. gauge and a superheat of 125 degrees F. and a vacuum of not more than 2 in. absolute back pressure in the exhaust chamber, was 16.4 lb. of steam per kilowatt-hour. Because of the urgent need for the plant the efficiency test was postponed until the station had been in operation 14 months. Then the machine was tested on the regular commercial load which it was endeavored to keep as nearly constant as possible throughout two runs of four hours each, with loads approximating 7000 and 9000 kw. respectively. The results showed the steam consumption per kilowatt-hour to be 16.06 and 15.95 lb. without correction, and 15.82 and 15.42 lb. after correcting to make the actual conditions conform with those called for in the specifications. Both tests showed that the builder's guarantee had been exceeded, the figures being approximately 3½ and 6 per cent. in each case.

This paper was presented in abstract for the author by J. T. Whittlesy. The foregoing papers were presented in succession that they might be discussed together.

Written discussion was received from J. H. Lawrence, who found the results in Mr. Naphtaly's paper to vary considerably from those which he had calculated and to give the turbine a much lower heat consumption than he thinks it should be credited with. He has tried methods and used both the old and new steam tables, but has been unable to check the figures given in the table. Where the paper gives a thermal efficiency of 22.65 per cent. he finds that it should be 20.27, and he concludes his discussion with a table showing the revised results as calculated with the Marks and Davis steam tables.

Prof. J. D. Jacobus thought it would be interesting to know what gas engine men have to say about what they could do in comparison with results of these papers as to B.t.u. per kilowatt-hour.

I. E. Moultrop, referring to Mr. Varney's paper, considered it interesting to note that the steam turbine has operated satisfactorily in parallel with a large number of water power stations and given better service in regulation and maintenance than either steam engines or gas engines. He congratulated the engineers of the Pacific Gas & Electric Company on the short time in which they completed the 9000-kw. steam generating station and also on the very low kilowatt cost of this station. He hoped that the author would state briefly how this low cost was obtained. Although the water rate of the turbine was within the manufacturer's guarantee, he did not consider it very creditable for a Curtis turbine of 9000-kw. capacity. Its record with better vacuum and superheat should be improved 1¾ lb. Mr. Naphtaly's paper, he thought, contributed very valuable data on the Westinghouse double flow turbine and showed it very efficient considering the low superheat and vacuum used. He called attention to records made by certain installations, including a 3500-kw. horizontal Curtis turbine which gave a water rate of 13.62 lb. per kilowatt-hour and a 5000-kw. Curtis turbo unit in the Boston Edison Company which has done as good as 12.71 lb. He concluded from comparing results from various turbines that the impulse turbine receives more benefit from an increased pressure than the combined impulse reaction machine, which he thought curious considering that the high pressure elements are of the same type. The benefit from an increase of superheat is marked in both types, with the advantage slightly in favor of the double flow type.

George A. Orrok compared results from tests reported in the paper with other published tests and gave a table recalculating the tests on the same basis, using the new Marks and Davis steam tables. In making up

this table he used the actual test results, pounds of steam per kilowatt-hour, vacuum, superheat and steam pressure not corrected to the contract conditions. He found it simpler to compare the various machines on the basis of the British thermal units in the steam at the throttle valve and to credit the turbine with that portion of the heat turned back into the feed water system at the condenser temperature. This is what power producers are interested in and the heat units so calculated represent what they are paying for in coal.

E. D. Dreyfus discussed particularly Mr. Naphtaly's paper and commended the author for having selected modern working conditions to obtain the highest ultimate economy and for having indorsed an increase in rotative speed which obviously conduces to higher efficiencies. It appeared to him that doubling the rotative speed reduces the steam consumption 4 to 6 per cent., depending upon the size of the unit. It is sometimes indiscriminately stated that the higher the vacuum the better the over-all plant results. This, however, ignores the power consumption of the condenser auxiliaries. There is consequently a point where the improvement in the turbine performance fails to exceed the increased power demanded by the auxiliaries, and it is generally found that the most economical yearly average vacuum varies between 28 and 28.5 in., depending upon the source of water supply. While fuel economy is an important factor of the total cost of power, manifestly investments in operating expenses must also be reckoned with. He continued by analyzing the total money cost of power production in the plant and figured it at about $33.94 per kilowatt, including building, foundation, boilers, piping, conduits, oil storage and burning equipment, auxiliaries and electrical apparatus. The low total cost of a complete expansion turbine, he believes, settles the question definitely as to the advisability of introducing a combined engine-turbine unit in a new station to accomplish a small saving in fuel.

Francis Hodgkinson, who was present when the tests were made, expressed himself as of the opinion that high superheat cost so much money to obtain that it is not altogether an unmixed blessing.

Mr. Pigott criticised the papers as not giving enough data to allow interested readers to confirm the results reported and compared the advantages of engines in combination with exhaust or low pressure steam turbine installations. He considers that the additional investment is not great and is more than offset by the 8½ per cent. gain in economy.

W. H. Emmett made some comparisons between the two papers and commented on the small area of discharge at the low pressure end of the turbine described in Naphtaly's paper. The author's assumption that the engine with a better load would give higher economy he thought fallacious, and believes that the turbine should be rated at about 7500 instead of 10,000 hp. He declared that the Curtis turbine gained 16 per cent. in economy with an increase in vacuum of 1 in. and the other turbine only 3 per cent. Its efficiency, he thought, would decline with higher vacuum and higher load. He referred to records of different turbines abroad which are reputed to be better than ours, and declared that as a matter of fact turbines built by the General Electric Company, including a five-stage, 3000 kw., and a six-stage, 3000 kw., machine, have both done ¼ lb. better than the Curtis turbines built by the German manufacturer, the Actien Gesellschaft. He does not advocate superheat above 200 degrees.

Mr. Walker considered the paper important as showing the development in high speed turbines. Better design and construction, he believes, are necessary. He regarded the turbine described in Naphtaly's paper as one which should go on record as an important advance in this connection. General mechanical design has been thoroughly worked out and this is the forerunner of a large line, he believes, of high speed units.

## Notes on the Value of Napier's Coefficient with Superheated Steam

BY ISAAC HARTER, JR., BAYONNE, N. J.

The paper comprises a report of a series of determinations of the value of Napier's coefficient for steam at pressures between 138 and 148 lb. gauge and for various degrees of superheat ranging from 45 to 195 degrees F. In making these tests the boiler used was fired with a chain grate stoker and fitted with a special type of superheater so designed as to secure conveniently various amounts of heating surface with practically constant superheat for each arrangement at a given boiler capacity. Each test lasted five hours and followed a preliminary run of four to five hours. A special feed line was used and care taken to inspect all parts of the boiler before and after each test to eliminate all chance of leakage. The feed water was carefully regulated and was measured in two tanks. The diaphragm containing the orifice was placed a short distance beyond the superheater outlet, and immediately below the diaphragm a thermometer well and connection for a pressure gauge were placed. Both of these instruments were specially calibrated. The outlet beyond the diaphragm consisted of a fixed length of piping, and pressure readings taken just beyond the diaphragm gave pressures which were entirely negligible with respect to those on the high side of the diaphragm as far as any effect they might have upon altering the steam discharged. The orifice used in all the tests was formed in a ½-in. plate with edges rounded to a ¼-in. radius, the contracted diameter being 1.2 in. The results showed that with increased superheat the value of the coefficient and the volume flowing at constant pressure increased, but the weight of steam flowing at constant pressure decreased.

A discussion submitted by H. E. Longwell stated that it would be interesting to learn how the equation $W = \frac{Pa}{70}$ came so universally to be ascribed to Napier, for he believes this equation for the relationship between the weight and pressure of steam escaping from an orifice originated with Professor Rankine. He regretted that the author had not included in his paper the actual logs of the test. That the coefficient for the equation calculated by the author differed from the commonly accepted one, he considered, was probably due to an unhappy selection of the form of orifice employed, for it has been found that any difference from the form of theoretical maximum efficiency can affect the rate of flow as much as 11 per cent. Concluding, he hoped that the author might obtain further data along the same line, using two or more different pressures, and preferably a more improved form of orifice. The data thereby obtained should constitute a substantial foundation on which to build an extension to our present knowledge of action and properties of superheated steam.

Another written discussion read by the secretary was from Prof. R. C. H. Heck, who compared the experimental results given in the paper with the theoretical values of Napier's divisor deduced for the ideal truly adiabatic steam jet. His discussion gave curves graphically comparing these values and his calculations of the points on the curves. The steam quantities in these calculations were taken from an as yet unpublished table of the properties of steam, which differs from the Marks and Davis tables by amounts lying within the region of experimental indeterminateness. The two curves he gave agreed well in form and indicated a coefficient of discharge of 0.97 to 0.98. In this connection he thought it well to show how the coefficient of discharge works out for another set of flow experiments, those of Rateau, which he showed to be 1.02. If this be taken as a normal coefficient and compared with 0.975 in the present experiments, it appears that there is a total contraction effect of about 5 per cent. in the author's orifice.

In his closure the author explained that the readings were taken in connection with another test and that the orifice was accidentally not of a standard form, for which he was sorry. This concluded the Wednesday afternoon session.

### REUNION AND BALL

As explained in the introduction to this report, the social reunion, which ordinarily takes place on Tuesday evening, was deferred to Wednesday evening, its place being taken by the president's reception, which ordinarily occurs on Thursday evening, and the dance followed the social reunion Wednesday evening instead of the president's reception, as heretofore. This was held at the Hotel Astor, in the grand ballroom, where those who did not wish to participate in the dancing might visit together and watch those who did. During the evening a collation was served.

### FOURTH SESSION

Thursday morning the professional sessions were resumed in the auditorium of the Engineering Societies' Building to consider a group of miscellaneous papers, the first of which was

#### A New Theory of Belt Driving

BY SELBY HAAR, SCHENECTADY, N. Y.

While investigating the subject of belt efficiency the author deduced a theory for the transmission of power by leather belting very different from the one generally accepted, and the paper presents this theory and a study of the losses occurring in a belt while under load so that its efficiency may be determined. When a belt stretched over a pair of pulleys is at rest the tension on both sides is the same, but when the pulleys are in motion and power is transmitted the tension in the tight side increases while that in the slack side decreases, their difference furnishing a measure of the power transmitted, and this tension is varied by using different kinds of pulleys and by the action of centrifugal force. Some empirical constants published by C. Otto Gehrckens which he derived from experience show that the allowable effective pull increases with the speed and at a constant speed the load increases with the diameter of the pulley. Professor Kammerer of Charlottenberg confirmed this by a series of over 1000 tests on belt transmission and arrived at the following conclusions which form the basis of the new theory: The maximum allowable tension in a belt apparently increases with the speed; the coefficient of friction also increases with the speed and reaches values far above those usually assumed; the maximum efficiency of transmission is not limited by the speed; the coefficient of friction is larger for large pulleys than for small ones and for a wooden one than an iron one when new; more efficient transmission is secured when the small pulley drives, and this can be improved by a properly placed idler. The various apparatus used by different experimenters and the methods of testing employed are described. The author develops a method for calculating the efficiency of a belt and works out an illustrative example. For the purpose of comparison data from several tests are included. In conclusion, the author states that the maximum allowable tension in a belt is not constant and neither is the belt velocity, although the pulleys revolve at a constant speed. Very high belt efficiencies can be secured and, while these are as a high as a good gear transmission, the overall efficiency is considerably reduced by the larger amount of power consumed in overcoming bearing friction, which shows that improvements should be made in the bearings.

George M. Van Buren, looking at the subject from a commercial standpoint, concluded that the best belt drives are those which are best investments. It appears to him that the mean between the German high speeds and our own moderate speeds would represent the best practice. He is in favor of decreasing the slack side tension and increasing the arc of contact, thereby decreasing the total belt tension. The slack side tension, he considers, can be best maintained by idlers. It is perfectly possible to make safe pulleys for high speeds, to substantiate which he cited a 48-in. iron hub and spoke wood rim pulley tested up to nearly 5½ miles per minute peripheral speed without bursting.

R. G. Reist found some conclusions in the paper very interesting. Anything that will lead to the reduction in the size of belts will be welcome. Large belts, he declared, are very unwieldy, and his experience is that low speed belts are in more demand than high. He took issue with one of the previous speakers that the electrical companies are not interested in belting. Carefully designed belt drives are much more important than they were a few years ago.

This paper was discussed in writing by A. F. Nagle. He considered the definite establishment of the relation of the diameter of the pulley to the belt power transmitted to be of great interest and value. Hitherto it has been a matter for the judgment of the engineer to make some allowance for the size of pulley. Accompanying his discussion were diagrams plotted to show various relations between power transmitted, belt pull, speed, &c., as taken from older rules, the study of which show them all to be inapplicable to small pulleys, but that approaching 20 in. in diameter they do not vary much, although from 40 in. to 80 in. and upward deviations become apparent again. It is declared by one engine builder that a single belt will safely transmit power according to the common rule of 600 ft. in. per horsepower-hour, and that a double belt will transmit 50 per cent. more. If the load does not exceed 60 per cent. of the capacities enumerated in a table given, the life of the belt will be greatly prolonged and care required to keep it in good running order reduced to a minimum. It is considered good practice by engineers to keep the service required of belts within the figures in this table, using them as maximum for overloads. The discusser considered that this advice is still well within the results of these new discoveries.

Harrington Emerson dissented with the conclusions in the paper in a number of respects. Slip, he maintained, is what causes wear; the less the slip the greater the power transmitted and the less the wear. He did not favor attempting to transmit as much power as that given by the paper as a minimum.

F. W. Taylor deplored the lack of conclusions or anything to indicate what has been brought out that is new. He told of trouble with belts running at 5000 to 6000 ft. per minute by taking advice given in a paper by Wilfred Lewis on tests he had made. Economy and all around operation, not transmission efficiency, is the important consideration. Practical conditions, and not experimental ones, should govern design. The loss of continuous operation of a shop or the stoppage of manufacture is the chief thing to avoid. He protested emphatically against the suggestion at the end of the paper of using belt speeds of 11,000 ft. per minute, and advised never running over between 4000 and 5000 ft. per minute.

Prof. T. M. Phetteplace was inclined to contradict the disparagement of the value of theoretical investigation, but acknowledged that the greatest convenience at least cost are the important considerations. He would like to see belt experiments carried out for long periods on different kinds of bearings to determine the results. It would seem that speed should not be increased much. The coefficient of friction can be increased by cork inserts and experiments on their effect in the continued operation of belts would be interesting. If a belt when too loose will slip and when too tight will fail, then it appears tension is a ready measure of what should be used. He mentioned a plant which has been running 10 years where they are well pleased with the use of binder pulleys and would like to see results of experiments on the use of such pulleys.

George I. Rockwood commended Mr. Taylor in the criticisms he had made of the paper and his statement on allowable speeds. Large belts, however, he said, can be run at 5000 ft. and have been so running for 30 to 40 years.

William Kent wanted details of the figures given in the paper before it goes into the society's transactions. He stated that 25,000 ft. per minute has been the highest speed on record, and he wants to know how 74,000 to 98,000 ft. could have been attained without bursting the pulleys unless they were made from forged vanadium steel.

In his closure the author admitted that the figures of foreign results which he had mentioned he could not guarantee were correct, but he gave references where they were found in print.

## A Graphical Method for Calculating Stresses in a Connecting Rod

BY WINSLOW H. HERSCHEL, NEW YORK.

Connecting rod stresses are usually calculated by empirical formulæ, which, while sufficiently accurate for slow engines where the inertia may be neglected, are of questionable value at high speeds. The majority of the analytical formulæ are also unsatisfactory because they are based upon assumptions which, in the opinion of the author, are incorrect. After a discussion of the usual assumptions made in applying these formulæ with reference to how they may be avoided, three numerical examples of the application of the author's new method are given. This is a graphic one and is applicable for finding the stress at any point in a rod of any shape. The process of determining the inertia forces at any particular point is simplified by using a diagram calculated from exact formulæ. The bending moment due to inertia is calculated from the usual polygon of forces, and there are two additional moments, one equal to the static weight and the other equal to the axial thrust multiplied by the sum of the deflection and assumed eccentricity of loading. Mohr's method is employed for determining the deflection and the amount of eccentricity assumed is in accordance with the conclusions of Moncriess. The results obtained from the numerical examples show that in a simple shaft of uniform stress the maximum bending moment and maximum diameter will be less than 0.6 the length of the rod from the cross head end, and the maximum bending moment at any point will occur at about 38 per cent. stroke. The results show stresses much greater than those given by the usual formulæ, and this is to be accounted for principally because the bending moment due to the axial pressure is considered.

This paper was presented by the author, who stated that he was induced to devise this method because he found no rules for finding the stress at any point in a connecting rod and that he had founded it mainly on Mohr's method for determining deflection.

A written discussion on this paper was read by Secretary Rice from L. L. Willard, who declared the paper interesting for its graphical method of finding stresses in a connecting rod and its reference to many former methods. What is more valuable to engine designers, however, is a method of calculating which can be applied with little labor With keen competition such as has been experienced in the last few years, the engineering departments of manufacturers are seldom given time to investigate many subjects which without doubt are interesting but not considered necessary. Builders of steam or gas engines must standardize their parts as far as possible to reduce the cost of manufacture. They are therefore led to make certain parts stronger and heavier than might be otherwise necessary, so that they can cover a range of sizes. While the methods offered in the paper eliminate some of the usual assumptions in calculations, others are necessary, so that it still requires judgment in the selection of certain values about which no more is known than that covered by the usual factor of safety allowed taking care of inaccuracies and making diagrams, calculations and minor assumptions. The graphical method the author had proposed is much more complicated and the chances of error are thereby increased, requiring much more labor than usual. Therefore the discusser concluded that the results given seem to be no better for practical use than the shorter method.

Prof. Gaetano Lanza took exception to the statement that no analytical method can be used. Locomotive builders will figure stresses in rods if told where to figure them. The graphical method, he said, is interesting, but he failed to see where it is simple and believes it foolish to consider flexure of the rod as a column

In his closure the author stated that he failed to find any simple analytical method. He thinks that the taper of a rod changes the point where the greatest stress comes, and that it may be at other than midway of its length.

## Operating Conditions of Passenger Elevators

BY R. P. BOLTON, NEW YORK.

The paper is concerned with the principles that affect and limit the service of passenger elevators. The operation of a passenger elevator is unlike that of reciprocating mechanisms, as the time during which it is in actual motion is only part of the total time of its service. The time of service may be divided into two divisions, passenger movement and machine motion. The first is that which is consumed when the car is not in motion but is awaiting the movement of passengers, and it has a close relation to the number of passengers carried. From observation the author has determined that this average is 15 sec. per passenger per trip. The machine time is divided into three main parts —acceleration, travel and retardation. The first and last are more important than high running speed and the electric traction elevator is superior on these points. The effect of counterbalancing is discussed and it is suggested that observations of passenger traffic be made in order that the proportion may be determined. Records of observations are given showing the flow and distribution of elevator traffic and the effect of excessive traffic upon the traveling powers of the elevator. These test records also serve to bring out the results of an undue proportion of stops and starts, as they are plotted to correspond with the equivalent live load and serve to indicate the excessive cost in power consumption. The tests which formed the basis of these diagrams were made upon elevators of all types under widely diverse conditions, both as to the amount of traffic carried by the elevators and the length of the elevator travel.

This paper was presented in abstract by the author, who gave a number of lantern slides showing the variation in elevator traffic throughout the week day in a number of important office buildings.

Calling attention to one of the tables of the author's paper, Mr. Hollander thought it would be desirable to know the maximum load carried to know whether overbalance of the elevators could be reduced. In his closure the author stated that he would add data to his paper to show the maximum load carried on each trip.

## Modern Shoe Manufacture

BY M. B. KAVEN, BEVERLY, MASS., AND J. B. HADAWAY, BEVERLY, MASS.

The earliest forms of footwear were soles of various materials fastened to the feet by thongs. These gave place after a process of evolution to the hand sewed shoes, which require 11 operations to complete them. Fifty years ago a shop making hand sewed shoes on an average employed three persons and all work was done by hand. The first important change was the introduction of the McKay sewing machine. Other developments were pegging, screw and loose nailing machines, but the paramount object, which was to produce machinery for making shoes by the hand sewed method as that gave a smoother inside finish and more flexible soles, was not attained until the Goodyear welter was placed on the market about 20 years ago. In a modern factory the power plant is located outside the main building in a one-story structure and furnishes steam for power and heat, electricity for light and pumps water for the sprinkler system. The various processes and the special machines employed are all described. The welt sewer previously mentioned is the most important of all the machines, although not the most complex, and its construction and operation are given considerable space. Employing the various machines described enables shoes to be produced which retail cheaply and excel in comfort the custom made shoes costing much more.

Mr. Hadaway, one of the authors, presented the paper and showed models of lasts and gave other details and explanations of the points brought out in the paper with regard to the manufacture of shoes.

The paper was discussed by Edwin J. Prindle, who declared that shoe machinery is interesting for its mechanisms aside from whether the engineer is interested in shoe manufacture or not. A Goodyear welt shoe requires 60 machines for its making. Interesting mechanical movements are involved and numerous adjustments for variable nature of material and different shapes of lasts. Attempts are being made to make automatic machinery to take the place of the operator in feeding the shoe to the machine.

Professor Robinson thought that it would add to the value of the paper to include the diagrams which were shown in the presentation of the paper and more concerning just what a shoe factory is and the whole mechanical engineering side of it instead of just the machinery alone.

I. E. Moultrop read a letter from R. H. Long, president of the Long Shoe Factory, a new one near Boston, in which he stated that the paper was very interesting

in describing the making of welt shoes. More attention, he affirmed, is now being paid to patterns and lasts, but he declared that no broad improvements have been made in shoe machinery in the last two years.

In his closure Mr. Hadaway took exception to this last statement, saying that $6000 to $7000 a year is spent by the United Shoe Machinery Company alone on improving machinery, and the company is looking for new ideas to give shoe manufacturers the best possible facilities. An invention is now being developed that will cut the cost of the manufacture of shoes 2 to 3 cents a pair. He submitted as supplementary to his paper, data with regard to the four-story Goodyear shoe factory referred to in his paper, giving the factory space, floor space, output capacity, equipment, layout of departments, power required to drive various machines, all of which are motor driven, number of employees, and further data in detail concerning the output of individual machines in the various departments.

## FIFTH SESSION

### General Section

The main session, held in the auditorium, considered three papers dealing with machine shop topics. All three papers were presented before the discussion, which was general on all of them. Abstracts of these follow:

### The Field for Grinding

BY C. H. NORTON, WORCESTER, MASS.

While grinding in various forms has been known from the beginning of history, at the present day it is looked upon as a slow, expensive, but sure method of obtaining accuracy. The discovery of the polishing wheel enabled work to be done quickly, but as the term was still grinding, the conception that it was a slow process persisted. At the present time the modern grinder and grinding wheel enable all kinds of round work to be sized more cheaply than by turning and filling, and the greatest economy is secured by a combination of grinding and very rough turning, although there are cases where it is cheaper to grind direct. It is not always possible to obtain the rough turning required by true grinding economy, although it is possible to get much more out of present plants by cheaper turning if grinding is utilized. It should no longer be assumed that a grinding wheel cannot remove metal and shape work as quickly as a steel tool, but the latter should be used when it can do the work cheaper and the grinding wheel when it excels. Poor wheels, or good wheels wrongly used, will still remove metal slowly, but a modern grinding wheel used in a modern machine is a milling cutter just as truly as if made of steel and is to be regarded as a cutter with millions of teeth, which, while they may not cut so deeply, can cut more rapidly, as for example at speeds of 6000 or more surface feet per minute. Cams and crank shafts can be produced cheaper by grinding than by turning. With automatic grinders it is possible to turn out work even more rapidly. Where 300 pieces per day were ground by piece work, 2300 are now produced. As the knowledge of grinding becomes more common and the opposition on the part of workmen to increased production is overcome, the field for grinding will be still more extended.

### Precision Grinding

BY W. A. VIALL, PROVIDENCE, R. I.

Grinding is an art rather than an exact mechanical operation, and its growth is so recent that relatively little is known about it or its possibilities. The author considers it an art, since it contains elements where the operator's judgment and experience count. The manufacturer can give instructions for running machines, telling the operator to use a certain wheel and speed and still results may vary; the surface of the piece may appear gouged, show wheel marks and have dull finish or be highly finished. There are two important classes of grinding, tool room or shop grinding and manufacturing grinding. The question of accurate fit does not enter into the first class of work, but is important in the second and is coupled with a high rate of production. The machine used must be able both to do the work and be operated conveniently. The latter is important, and the machine must produce true work. The principles underlying grinding are not difficult to grasp, but the work requires enough skill to class it as an art. The first use of the grinding wheel was to correct slight errors that could not be rectified by a file and emery cloth, while to-day it not only does this but also finishes work in a relatively cheap manner. After the machine has been selected, the choice of wheels requires some special knowledge which the makers can furnish. The question of speeds and feeds is the result of experience, and here again the makers will help. The wheels must be true and must not be forced into the work, as this produces a torn finish. The question of limits and sizes is first to be considered, followed by the extent to which rough turning is to be done. The practice at the Brown & Sharpe plant is to allow a variation of 0.008 to 0.012 in. in diameter and by so doing secure a finished product free from tool marks at a minimum cost. If enough pieces of one kind are to be made to make it worth while to specialize to a higher degree than is possible in ordinary work, better results can be secured. The general rule of having one man to two machines is reversed, as the best results are obtained with two men to a machine, one to operate and one to assist in mounting the work.

### Modern Grinding Methods

BY B. M. W. HANSON, HARTFORD, CONN.

Grinding is the oldest known means of shaping material. The grinding machine of to-day is of comparatively recent origin. Grinding machines resembling modern types were first made in England but have been most developed in America. The invention of emery wheels made it possible to make fairly rapid progress with grinding processes. At first very little work was ground which could be machined and filed, but after a while it was discovered that unhardened pieces could be machined and finished more accurately and cheaply by grinding than by finished turning and filing. Within the last few years great improvements have been made not only in the cutting quality of the wheels but in the design of the machines themselves. At the present time grinding machinery has become a formidable competitor of the lathe and milling machine and seems to be quite up to the cutting capacity of the wheels. The designers of grinding machinery have had many problems to solve as different materials require different speeds and on the modern machine there must be various speeds for the grinding member as well as for the traverse movement of the work and for the revolution of the work in the case of the cylindrical grinder. Two large groups of grinding machines are now used: those for cylindrical grinding and those for grinding flat surfaces. The former are well known and have been highly developed, while the latter is best known as the planer type of machine with a wheel grinding on its periphery and fed across the surface. Another type is the vertical surface grinder with a cup-shaped wheel working in much the same manner as an end mill on a vertical milling machine. To eliminate the necessity for readjustment due to the wear of the reducing member two devices have been designed to control the size of the work. When the work has reached the desired size, the machine will automatically throw out the feed and new pieces can be put in. It is possible for an operator to manipulate more than one of these machines and less skill is required to get uniformity of size. In this design the size of the work is controlled by contact with the work itself, which is the preferable way. Another recent device is the back rest, which automatically is kept in contact with the work and supports it as rigidly as possible throughout its length. The construction of both of these devices is described at length. For flat grinding the cup-shaped wheel has taken the foremost place although this would not have been possible had it not been for the advancement in wheel making. It is difficult to make an exact rule as to what the feeds for different material should be, but the operator can determine this by running the machine a few minutes, as wheels supposed to be made to the same specifications vary considerably, and consequently the feed has to be regulated not only to suit the material being ground but also the cutting ability of the wheel. The author believes that at the present time grinding machinery is fully developed to the cutting capacity of the wheels, and there will probably not be any essential changes until the grinding wheels have reached a higher development.

This paper was read almost in full by the author. W. L. Bryant, who opened the discussion on all three papers, said that in his opinion they are of great interest and the authors have given information and data of value to manufacturers employing grinding machinery. Grinding is an economical process and the economy is not only in the saving in the labor cost, but also in the saving in the work of assembling ground parts.

A. L. De Leeuw read a written discussion in which he characterized the papers very opportune, since of all machine tools none is less known and understood than the grinder. Literature and pamphlets by makers of grinding wheels and grinding machinery give some definite information on this subject, but from the purely scientific standpoint nothing really good has yet

been written. The main reason for this is that no extensive experiments have been made except by the makers of wheels and grinders, and they regard their results as valuable private property. Present knowledge of all other machine tools has been gradually collected from an immense amount of experience and a few experiments, and the grinder is still so young that little definite knowledge exists with regard to it. The shape and hardness of the steel lathe tool can be determined relatively simply and the way in which it is held is very definite and obvious to the eye. The tool used on the grinder, on the other hand, is very complex, consisting of millions of little grains of various sizes, which are held in a binder of unknown quality, consequently the tool is one of which only the average qualities are known. While all literature upon grinding wheels emphasizes the great care that should be taken in selecting a wheel. While each particular kind of work and finish calls for a different kind of wheel, no final recommendations that a certain wheel is on the average the best for such and such material have been made. Great stress has been laid on the necessity of the proper relation between the speed of the wheel and the speed of the work. The writer's experience has been that every mechanic has his own rule for the speed of the work. It is impossible to run at the proper speed where a machine has only two speeds, and the size of the wheels varies from 18 down to 10 in. Great stress has also been laid on proper relation between the width of wheel and the width of feed, but at present the traverse of the table is not made a function of the number of revolutions of the work. Grinders are one of the greatest factors of economy. The grinder is not taking work away from the lathe, but rather in former years the lathe has done work which the grinder should have done. It is rather remarkable that the vertical surface grinder lagged behind so long and the men who have developed this type to its present efficiency are entitled to much credit. As regards the comparative performances of a vertical grinder and a milling machine for certain classes of work, the writer stated that frail work with relatively little material to remove, and where nothing but a flat surface is to be produced, is an ideal job for the vertical grinder, and, on the other hand, that stocky work with much metal to be removed is better adapted to the milling machine. In the case of flat irons, which Mr. Hanson called attention to as being especially suitable for grinding, Mr. De Leeuw cited an instance where they were turned out at the rate of 150 per hour on the milling machine, with a slightly coarser finish than that obtained on the grinder, and at the rate of 105 per hour with a finish of the same kind as that given by the grinding machine.

The secretary read a written discussion from H. A. Richmond, which gave as the writer's experience that only the builders of grinding machinery well understand the selection of the right kind of wheels, and some of them treat it as of little importance. The sending out of machines equipped with wheels wholly unadapted for the work which they are expected to grind has sometimes resulted in the rejection of the machine, where the builder could have supplied wheels which would have given satisfaction. He cited an instance where a disk wheel surface grinder was unable to grind small high speed steel pieces flat with the wheel that was supplied, but when another was furnished the pieces were ground perfectly flat. It is proper to class grinding as an art. In selecting wheels the abrasive material and its hardness and coarseness are to be considered. Even the experienced wheelmaker can hardly give more than general recommendations in his catalogues, as conditions vary essentially in every plant, but each plant can readily select wheels adapted to its own requirements if the principles of selection are understood and appoint an expert for this work; the question of speeds and feeds can be left to the foreman or operator.

L. C. Higgins read a contributed discussion from G. N. Jeppson, which appreciated the vast amount of useful information given in the papers. They have shown clearly that the modern surface grinder and cylindrical grinding machine must be seriously considered by the production engineer. Great progress has been made in the materials used in grinding wheels until they have become highly developed cutting tools. At present the wheel is not used to its cutting capacity because few grinding machines are correctly and scientifically designed. The conditions under which the work is done also has some influence on the grinding wheels. The problem of the wheel maker is not only to find the proper size of cutting grains and strength with which they must be bonded together for grinding a particular metal, but the additional strength of bond necessary to withstand vibrations brought about by mechanical defects in the design of the machine upon which the wheel is mounted. In reading Mr. Hanson's paper the writer wondered whether he has ever considered the surface grinder of the planer type using wide wheels with rapid speeds and a greater depth of cut. Grinding by the cylinder system will always produce hair-like chips, as the depth of the cut is infinitely small on a broad surface, while grinding on the periphery of a wheel on the same metal will give a larger chip, since it is possible to get a greater depth of cut. A machine of the planer type can be constructed which will consume less power and be more efficient in wheels and do faster work than any surface grinding machine yet devised, and until this has been done the abrasive wheel will not be brought to its full efficiency on this kind of grinding.

Henry Hess took issue with Mr. De Leeuw, saying that he thought the latter did better with the grinding machine than his discussion would indicate. The grinding wheel has advanced farther than any other machine tool, considering the time devoted to its development. Concerning the adaptability of the grinding wheel, he cited instances where the lines of work handled were very diverse, as, for example, mining machinery and agricultural implements, which are satisfactorily handled by the grinding wheel, the finished products being within very narrow limits. At the speaker's plant work is regularly being ground to within a limit of 0.002 in. In his opinion the maximum output of any tool, regardless of what it might be, can be obtained only after some experience has been had in running it, and not from any directions from the manufacturer.

H. M. Leland said that grinding was a very dear subject to him, as he was in charge of the department at the Brown & Sharpe plant, in which the first grinder was used. In his opinion grinding has done more for the industrial development of the country than any other machine tool. While formerly tools after being accurately made would be spoiled by the heat used in tempering, it is now possible to eliminate this trouble by grinding them after they are hardened.

Oberlin Smith, the next speaker, said that the question of avoiding dogging should not be taken into account. As a substitute for dogging and turning the work he recommended the use of a square center at one end. This is not possible in a lathe, but is in a grinder, and when used the grinding can be carried on in one direction instead of from either end and turning the pieces.

J. W. Cole stated that one reason why grinding had not been more generally adopted was because when it was first introduced the mechanics expected too much reduction at one stroke. Heavy cuts heated and sprung the work and the wheels capable of taking heavy cuts were not economical.

C. H. Norton in his closing remarks stated that the object of his paper was not to tell how grinding should be done, but to arouse interest. At present the difficulty is to get people to listen to what the manufacturers of grinding machinery have to say.

Nobody knows all about grinding, and the manufacturers are after the engineer to come along and describe the process, as they themselves have no time. It is a mistake to suppose that a coarse wheel will cut a coarse surface. A coarse wheel with a hard bond will produce a mirror finish on chilled steel rolls. The difficulties mentioned by Mr. Hanson in his paper as to the wearing away of the grinder, making the work difficult, is, in his opinion, only relative. The cup wheel is ideal for certain things where it is difficult to hold the piece in position. The speed of the grinding wheel is not as important as was formerly thought, since certain materials work best with certain speeds, and the only essential is that the speed be kept constant within reasonable limits. An ordinary operator can become sufficiently skilled, in his opinion, in a few days to get the proper speed for rapidly turning out work. A large number of different wheels would have to be carried in stock to meet the whims of certain foremen who would use only that particular grade of wheel, even though some other would do the work just as well. In regard to the use of square centers, mentioned by Mr. Smith, he believes that accurate work could not be produced in this way.

W. A. Viall, in closing, agreed with Mr. Norton as to the reason the papers were gotten out. So little is known regarding grinding that the manufacturer has to work along profiting by experience. Grinding is used chiefly because of its economy. Regarding the limits of accuracy given in his paper, he said that these were for lathe work, and that the limit for grinding varied from 0.001 to 0.00025 in.

### Gas Power Section

The Gas Power Section convened on the sixth floor of the Engineering Societies Building in the afternoon, with the chairman, J. R. Bibbins, presiding. In a splendid address he reviewed what has been accomplished by the section in the year just ended and indicated something also of the forces which are at present retarding the development of gas power work. He gave some glimpses of the future in this field and outlined the position which gas power is destined to take in engineering economies. He also brought out the importance of co-operative research, and laid down some lines on which the work at the section might be prosecuted in the future with advantage. Reports of various committees were then presented in abstract by Secretary George A. Orrok, including the Membership Committee, Meetings Committee, Literature Committee and Gas Power Installations Committee. For the Gas Power Operations Committee a brief report was presented verbally by I. E. Moultrop. The report of the Committee on the Election of Officers declared the election of Prof. R. H. Fernald as chairman and George A. Orrok as secretary for the ensuing year. The consideration of the meeting was then given to the papers which had been prepared.

### First Large Gas Engine Installation in American Steel Work

BY E. P. COLEMAN, BUFFALO, N. Y.

As is well known, the gas engine installation in the Lackawanna Steel Works, Buffalo, N. Y., was the first of considerable size in this country. It was made at a time when many of the features of design and operation which have now been worked out were not available, and it, therefore, does not represent modern practice. However, when considered from the standpoint of continuity and reliability of service the operation must be considered successful, and the economy of heat consumption is considerably in excess of that usual with compound steam engines. Parts which are now acknowledged to be open to criticism are the gas cleaning and distributing apparatus. The distribution of water in the cooling towers is also admitted to be defective and the flows are counter current only in alternate towers. The gas washing stands are less efficient than cleaners and require a greater amount of power than approved rotary scrubbers of more recent design. The mains of the three pairs of furnaces are not interconnected, and the cleaned gases from the several washeries do not meet in a common mixing main. The normal blast pressure may be taken as 16 pounds gauge. The blowing engine having but one blowing cylinder could not conveniently be equipped with unloading devices, and the powering of the engine is, therefore, necessarily excessive, the units being required to operate against a maximum pressure of 30 pounds. The work required to drive the air and gas pumps amounts to 20 per cent. or more of the indicated power, entailing a net mechanical efficiency which is unsatisfactory. Efficiency trials were made upon a blowing engine already arranged for piping. This engine was equipped with a motor piston having but three instead of five packing rings. The 1000-hp. unit upon which the other trials were made was equipped with five rings at each end of the piston. The compression of the 1000-hp. engine was greater than that of the blowing engine, and the various efficiencies indicated are somewhat higher in the case of the smaller engine. An increase of compression to 180 pounds would possibly produce some increase in efficiency. The lowering of the efficiency is principally due to pump work amounting to 20 per cent. of the motor power or more, and incomplete combustion amounting to 30 per cent. or more of the total heat supplied. In the efficiency trials of the engines the gas was measured by a Venturi meter. The efficiency of the meter was assumed to be unity, and no corrections were made for dirt and moisture undoubtedly present. The heating value of the gas was calculated from volume analysis obtained with Orsat apparatus, the high value being used. In the analysis of the exhaust gases Orsat results were corrected by means of a correction chart plotted from the data of Dennis and Edgar, given in the *Journal of the American Chemical Society.*

The paper was presented for the author by E. E. Kiger, who had been associated with him in the making of the tests described. He referred briefly to the manner in which the data was taken and some of the conditions which were not altogether satisfactory.

Written discussion on this paper was submitted by George D. Conlee, who for two years worked under Mr. Coleman. He spoke from knowledge of how carefully the tests were made, and what a great amount of work was represented in the paper, and declared that the tests were possible only because of the experimental work done by Mr. Coleman in the use of Venturi tubes for the measurement of the flow of gases, the theory and results of which work were embodied in a paper presented before the society, entitled "The Flow of Fluids in a Venturi Tube." He further commented on the negative loop shown on the motor cylinder cards in the paper, analyzing its significance and probable cause which he attributed to the layout of the exhaust piping and the introduction of the water for cooling the exhaust. This sort of pressure diagram was obtained from all of the 2000-hp. blowing engines, while the 1000-hp. higher speed engines did not show the negative loop. In conclusion he stated that considering the condition of gas as received by the engines and the requirements of the service it is surprising that the engines have run so well. There have been times when a blowing engine has run as high as 75 days without stop.

Joseph Morgan regarded the paper as most valuable in the facts and experience it related. In his opinion, gas engines are now in fashion, and he believes that if all conditions should be studied it would be found that in many cases gas engine installations have been carried too far. Steel works which are located in regions where coal is cheap, he declared, have no need of gas power. Few plants, he believes, have a power factor of 50, and good steam turbine power plants can be built for about $55 a horsepower, where gas engine installations have cost $96 a horsepower. In the Cambria Steel Company, with which the speaker is connected, the power factor is about 45, so that a gas engine plant as large as would be necessary would be handicapped at the start in fixed charges, more than offsetting the difference in fuel cost with the two types as prime mover. Relative repairs cost more for gas engines and their life cannot be any greater and, perhaps, not as great as that of steam turbines.

Written discussion received from Louis Doelling, vice-president of the De La Vergne Machine Company, declared the paper to be the most comprehensive that has been presented on the subject. Since the plant was not only the first of its size and kind which had

ever been constructed, but was composed of engines which were themselves the first units to be built from an original and untried design, he considers that although the results are not entirely favorable to the engine, there is still reason to be proud of their work, while some of the difficulties he acknowledged were due to errors in design, he feels that a good many are due to the gas not being suitable for gas engine consumption, since it contains from 50 to 80 mg. of dust per cubic meter. The conditions were even worse four years ago, when the dust content often rose to 200 mg. A good modern gas cleaning plant is expected to deliver gas containing not over 20 mg. The early history of this plant was also marked by great instability of the chemical composition of the gas itself; a sudden rise in the hydrogen content was of common occurrence. This was bound to result in frequent pre-ignitions, and a large proportion of excessive wear and short life of the working parts was clearly due to these and the dirty gas. Defects in design have since been corrected and engines of the Koerting type which have been running for five years on clean gas have been found to show wear of less than 0.035 in. The most serious defect referred to in the paper, the high gas consumption, he accredited to the excessive load imposed on the engine by the gas and air pumps and that a very considerable quantity of gas escapes from the cylinder unburned. In later designs the consumption of power by the gas and air pumps has been greatly reduced by using automatic poppet valves, and the lead of the pump crank has also been decreased so the maximum pressure in the pumps is from 10 to 4 lb. He gave further ways in which in the present installation the escape of unburned gases to the exhaust pipe may be avoided. Some of the latest Koerting engines constructed have a heat consumption of not over 10,000 B.t.u. per brake-horsepower-hour. The discussion concluded with further records of improvements which have been made in engines more recently constructed here and abroad and accounts of their performance.

William A. Bole referred to the installation of four gas engines in the Edgar Thompson Steel Works, at Pittsburgh, which is now four years old, and contrasted some of the constructional features of these engines with those described in the paper, particularly that of the cylinder. He declared himself opposed to single piece cylinders, and indorsed the Westinghouse cylinder construction for its provision for expansion. Long pistons, he declared, are bad from lubricating considerations, and criticised the method of lubrication used at the Lackawanna plant. Referring to the general notes relating to operation given in the paper, he was surprised at the extent of the wear on the piston cylinder and piston rod, believing that the lifetime of the rod should be about the same as that for steam engines.

Secretary Orrok thought that the author should have shown more of the plant. He explained that the dust carried over with the gases is very considerable on account of slips in the furnaces, and that under the circumstances the engines have done remarkably well. Nine-tenths of the trouble, he believes, can be laid to the location of the engines.

E. A. Uehling, who has visited the plant, confirmed these observations. He thought another mistake was making such a large installation at once. With boilers it would or should be necessary to clean the gas just as much as it is necessary for the gas engine.

C. W. Baker stated that he knew in a general way that gas engine installation is being carried nearly to the limit in Germany.

E. D. Dreyfus, who has had a chance to compare cost of steam and gas installations, thought that they might be in the ratio of 1¾ to 1, or even 2 to 1, but hardly as high as 4 to 1, as Mr. Morgan had said. He had seen dust plentiful, but doing no harm.

In closing the discussion Mr. Kiger explained that there is lots of dust in the gas, but that conditions are now being improved in this direction; considerable dust goes over from the furnaces, which is not all taken out by the washers. In answer to a request he gave a little sketch of the by-pass governor, which returns part of the gas into the supply pipe of the gas pump.

### Notes on a Heavy Duty Gas Producer

BY NISBET LATTA, MILWAUKEE, WIS.

In this paper the author calls attention to the recent development of the heavy duty gas engine and the fact that the gas producer has not been developed of proper size and type to accompany these large units. The paper outlined recent experiments on the use of pulverized coal injected with air in a proportion required to burn the carbon to carbon monoxide. The tests are not yet conclusive in their nature but tend to show the possibilities for the development of a heavy duty gas producer of this type.

W. B. Chapman had seen the producer in operation and was very much impressed with it. It can be built cheaply and generates an immense amount of gas for the space occupied, and generates it very rapidly. Possibly it is the producer of the future. Mechanical stoking must be developed, and then it should be possible to produce a uniform gas. He suggested making the producer in two parts, dividing it horizontally, with the upper part revolving, which will, he believes, prevent blow holes and insure uniform action of the fuel bed. Thus he thinks that large heavy duty producers can be made which will not have to be stoked by hand and will overcome all of the present operating difficulties. The hottest part of the fuel bed will be where the shearing takes place.

W. F. Winship thought that the producer described was of very low efficiency, considering the high thermal value of the fuel and the low thermal value of the gas produced.

The newly elected chairman, Prof. Fernald was then conducted to the chair, and in a few words of appreciation at his election to the office stated that in the next year's work he hoped that good use might be made of the very good ideas left by the retiring chairman in his address.

### THURSDAY EVENING LECTURE

This year the customary evening lecture was given under the combined auspices of the National Society for the Promotion of Industrial Education, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Institute of Mining Engineers. The title of the lecture was "The Industrial Continuation Schools of Munich," and was delivered by Dr. Georg Kerschensteiner, the superintendent of schools, and was illustrated by lantern slides. The need of some school to carry on the educational work where it was left off by the elementary schools was made apparent by the fact that prior to 1877 half a million children left the elementary schools of Germany each year. Although there were continuation schools in Germany prior to this time and the first schools were established in Munich, the development has been the greatest in that city. Two classes of schools were established, the first was a general school, where attendance of 5 to 8 hr. a week was compulsory for all boys between the ages of 13 and 16. In this school no regard was paid to the particular trade which they followed, and the instruction comprised general subjects, such as reading, writing and arithmetic. In the second class of schools, which were designed for the journeymen, the subjects taught included drawing, painting, &c., and no attention was paid to commercial training. In this school the attendance was voluntary.

From this condition of affairs the voluntary continuation schools had pupils, while the compulsory had none. This state of affairs continued until the last decade of the nineteenth century, when the general continuation schools were replaced by trade continuation schools. These gave instructions to apprentices in the evenings, and an effort was made to focus in-

terest on the student's trade. At first the bond of union between the school and the shop was lacking, as the boy was trained in the trade, but no emphasis was laid on practical work. As a first step to connect the so-called craft school with the continuation schools the work was made prominent and the boys soon came to appreciate the other subjects taught. After securing the interest of the students the interest of the employers was next solicited and was obtained as soon as they saw the pupils of the schools taking more interest in their work. These employers inspect the schools, make suggestions as to the selection of teachers and the amount of time to be devoted to the studies, supply models, and cause the apprentices to attend the schools.

The schedule of work done at these schools calls for from 8 to 10 hr. per week, which usually consists of two afternoons of 5 hr. each, or its equivalent, no Sunday or evening work being done. Special classes for further work and for gymnastics also form a part of the school. Other features are short courses for workmen temporarily unemployed, and the dull seasons are also utilized for giving instruction. The organization of the continuation schools is the result of an understanding between representatives of the various trades and the school authorities, and the apprentices must attend during the period of their apprenticeship, or in any event until they have reached their eighteenth birthday. As a result of these schools, individual selfishness is decreasing and the growth of a common interest is noticeable among apprentices and employers. In these schools the teacher is a foreman endeavoring to develop the ability of the students and the customary educational red tape and the visits of the attendance officer have disappeared.

The main object of the school is to teach that the meaning of life is not to rule, but to render service, and the pupils are taught to seek opportunities to do something for fellow students and for the country. At the present time there are 12 local continuation schools for boys, who are either employed in unskilled labor or in special trades, which have not enough apprentices to make it economical to have a special school. These schools are housed in private buildings, not entirely for continuation school purposes, while the trade continuation schools have their own special buildings. During the past year 9400 apprentices between the ages of 14 and 18 and 2700 journeymen were enrolled as pupils in the various continuation schools out of a total population of 600,000.

In addition to the local and trade continuation schools there are special engineering schools which are open to all journeymen in the engineering trades. A course here is four years and instruction is given nine hours a week for 40 weeks throughout the year. Extra work can be taken in optional continuation schools holding their sessions in the evenings. During the past year between 500 and 600 apprentices were enrolled in the 24 classes of day schools. In these schools the course includes practical work in the shops for two or three hours per week, and before this is done the patterns for the work are drawn, and when the work is finished its value is computed. The instructors are either workmen or trained teachers from the public school system, but in the workshop all the instructors are journeymen at the particular trade.

The girls are also taken care of by continuation schools, where they are taught cooking, sewing, &c. In these schools the instruction is given during four hours per week, but after 1912 this will be increased to 12 hours a week. The cost for educating pupils in these various schools of Munich has been calculated to be $24 per year in the primary schools and $18 per year per pupil in the boys' continuation schools. The total cost for the various schools are, primary schools, $1,700,000 for 70,000 pupils, $300,000 for 9400 pupils in the boys' continuation schools, and $70,000 for the girls' continuation schools. Austria, South Germany and German Switzerland have continuation schools which were modeled more or less along the same lines; those of North Germany are slightly different. In conclusion, the speaker laid special emphasis on the fact that a purely theoretical continuation school—that is, one in which little or no attention is given to practical work—would not succeed.

## EXCURSIONS

This year a new plan with regard to the excursions was inaugurated, that of devoting an entire day to them instead of having them alternate with the professional sessions throughout the meetings.

The New York Public Library was one of the places visited Friday morning, and was of special interest, as it is the largest library in this country, and was formed by a consolidation of the Astor, Lenox and Tilden libraries. Another one of the excursions was to the Navy Yard in Brooklyn, which has had its equipment increased until now it ranks as one of the largest, if not the largest, yard on the Atlantic Coast.

The Hudson and Manhattan Power House, which is the generating plant for the Hudson River tubes, known as the McAdoo system, was visited through the courtesy of G. McAdoo. The visitors were conducted through the power house, located in Jersey City, N. J., by the chief engineer, G. Sage. This plant contains four Curtis vertical turbines, two of 3000-kw. capacity and two of 6000-kw. capacity. The boiler plant equipment includes eight boilers in two batteries, each boiler having a rating of 900 hp. All stoking is done by hand and forced draft is applied. No. 3 Buckwheat coal is used, and burns from 12 to 17 per cent. ash. The boiler feed pumps are of the reciprocating compound type. The ventilating plant for the tunnel, the oil filtering room, switchboards, signal systems, coal bunkers, &c., were inspected.

About 25 or 30 took part in the excursion to the demonstrating plant of Nelson Goodyear, Inc., on Lorraine street, Brooklyn, N. Y., and the party was conducted by E. H. White, who upon their arrival gave a short account of the development and use of oxy-acetylene welding and cutting apparatus, following which a number of demonstrations were made and the action of the acetylene generator designed by Mr. Goodyear was described. Several novel forms of torches developed by him were also shown. A part in the interesting demonstrations was taken by André Beltzer of the General Welding Company, Hoboken, N. J., who has done signal work in connection with the welding and brazing of aluminum. He showed the use of his special flux for preventing oxidation in these processes.

One of the afternoon excursions was to the Thompson-Lovelace Aeroplane Company, at Fort George, New York City, visited by permission of Frederick Thompson. This factory is claimed to be the first of its kind in this country, and is the shop in which the aeroplanes, recently used at the Aviation Meet in Belmont Park, were rebuilt. The visitors were received by Captain Lovelace, who personally supervises the construction of his aeroplanes. He has had considerable experience as a balloonist, dirigible pilot and aviator. The machines manufactured by this company are all monoplanes, and follow the design and general appearance of the Bleriot, and therefore are known as the American Bleriot. At the present time the company has orders for 50 machines, two of which have been completed and 25 are under course of construction. One of the completed machines is of the racing type, and was made for Mr. Moisant for the trip he will attempt from Key West to Havana. The Bleriot monoplane used by the same aviator in his flight from Paris to London was inspected with considerable interest. The Lovelace aeroplanes are made in racing, flyabout, cross country and passenger carrying types.

Gnome motors and a motor designed by Captain Lovelace are used in the machines.

Among the other places visited in the afternoon was the dry dock of the John N. Robins Company, at Bay Ridge, which contained the latest examples of engineering in this line of work. The machinery of the large capacity pumping plant is all electrically driven, and there are many features of general interest to engineers. Another excursion held Friday afternoon was to the exchange of the New York Telephone Company at 15 Dey street. This exchange handles the local calls originating in the lower part of New York and a force of 210 operators are required to care for them. The toll boards for handling suburban calls and those of the long distance company were also inspected.

One all day excursion was made to the plant of the Pond Machine Tool Company, Plainfield, N. J. The party, which numbered 55, was taken to the works in a special car and after luncheon was served an opportunity was afforded to inspect the recently developed reversing motor planers, thread milling machines and car wheel lathes. The special feature of the reversing motor planers is that the control of the machine as regards the reversing of the table is entirely automatic and is accomplished by having the dogs limiting the table travel, control the direction and speed of the motor driving the planer, through a solenoid controller.

In addition to these excursions which were scheduled for Friday there were a number of others for which parties were not made up. These included the Metropolitan Building, power house of the Interborough Rapid Transit Company, which supplies current for the Subway in New York City; the publishing plant of the Hill Publishing Company, the Waterside station of the New York Edison Company, which was of special interest as being one of the very large plants with both turbine and reciprocating engines; the factory of the Simms Magneto Company, Watsessing, N. J., which is a very good example of modern factory construction; the high pressure pumping station of New York City, and the plant of the National Lead Company at Brooklyn.

## November Copper Production and Stocks

The report for November of the Copper Producers' Association shows a reduction in stocks of 8,872,854 pounds during the month. This compares with a reduction of 9,531,800 pounds in October. The report is as follows:

| | Pounds. |
|---|---|
| Stock of marketable copper of all kinds on hand at all points in the United States November 1 | 139,261,914 |
| Production of marketable copper in the United States from all domestic and foreign sources during November | 119,353,463 |
| Deliveries of marketable copper during November: | |
| For domestic consumption | 60,801,992 |
| For export | 67,424,316 |
| Total | 128,226,308 |
| Stock of marketable copper of all kinds on hand at all points in the United States December 1 | 130,389,069 |

The November production shows a decrease of 7,115,821 pounds on the output for October.

The Jacobson Machine & Mfg. Company, Warren, Pa., builder of gas and gasoline engines for agricultural, lighting and power uses, engine parts, &c., is operating all departments to capacity. The orders booked during November were double those of November, 1909. Some recent contracts include the following: Cornplanter Refining Company, Warren, Pa., one 60-hp. silent automatic engine; J. D. Biggin & Son, Sharon, Pa., one 50-hp. silent automatic; Lynndon Mirror Company, Falconer, N. Y., one 27-hp. automatic, and Goodwin Pottery Company, East Liverpool, Ohio, one 40-hp. automatic.

# Steam Turbines in Iron and Steel Works *

## The Curtis Type Described and Compared with the Gas Engine

BY R. C. MUIR.†

About 16 months ago, at your Buffalo meeting, we tried to show you that low pressure turbines could be installed wherever reciprocating engines of a fair size were used, at a very low initial cost per kilowatt capacity, and that electrical energy could be produced in a low pressure turbine plant at a figure far below anything attainable in any other type of plant; also that there was a large field for low pressure turbines in iron and steel mills, and that, in fact, in nearly every iron and steel mill low pressure turbines could be advantageously applied. At that time we had in operation or on order comparatively few low pressure turbines. At present we have in operation or under construction 70 low or mixed pressure turbines, aggregating a capacity of approximately 115,000 kw. Of these approximately 30 per cent. in number and capacity are for iron and steel mills. These turbines are operating satisfactorily under nearly every possible condition, and in every case have fulfilled or exceeded our expectations.

### A Comparison with Gas Engine Costs

There is not only a large field for low pressure turbines in iron and steel mills, but also for high pressure turbines. Where exhaust steam is not available practically the only competitor of the high pressure steam turbine is the gas engine. The thermo-dynamic efficiency of the gas engine is somewhat higher than that of the steam turbine, although under variable loads this is not so marked as under steady loads. This gain in efficiency, however, is more than counterbalanced by the high first cost and the high cost of operation and maintenance when compared with the steam turbine. Recently we made up a careful estimate of the initial cost of a 15,000-kw. steam turbine plant and a 15,000-kw. gas engine plant. Blast furnace gas or coke oven gas was to be used for fuel. The initial cost of the gas engine plant was 75 per cent. higher than that of the steam turbine plant. Evaluating the gas at the cost of coal having an equivalent heating value, and including all fixed charges and costs of operation for each plant, we found that the cost of power produced in the gas engine plant was 65 per cent. higher at 60 per cent. load factor and 75 per cent. higher at 40 per cent. load factor than power produced in the steam turbine plant.

### Advantages of the Steam Turbine

In choosing prime movers two things are always considered—economy and reliability of operation. In iron and steel mills particularly reliability comes first. At present there are several gas engine plants in which the operation is termed satisfactory. Nevertheless, the parallel operation of several large gas engine driven alternators is accompanied by heavy cross currents, "pulses" in voltage and series vibrations, and on the whole the operation is not all that can be expected. Aside from this, the gas engines are subject to serious mechanical difficulties, the mechanism is complicated and high class attendance is required.

On the other hand, the steam turbine is simple, the torque is even, the regulation close, and parallel operation is perfectly satisfactory. We, therefore, consider the steam turbine superior to the gas engine, both as regards reliability of operation and as a means of ob-

* From a paper read at the meeting of the Association of Iron and Steel Electrical Engineers, Pittsburgh, Pa., October 20, 1910.

† General Electric Company, Schenectady, N. Y.

taining electrical power economically. The steam turbine should be installed in iron and steel mills where additional power is required. If gas engines are already installed and additional power is required, steam turbines are especially desirable for the following reasons:

The regulation of gas engines is not good, and the overload capacity is low.

Due to the uniform torque, large flywheel effect and close speed regulation of the steam turbine, sudden changes of load are easily taken care of, and in connection with a gas engine plant a turbine plant would take the sudden fluctuations and greatly improve the regulation of the system. The gas engines would operate on practically steady loads, thereby greatly improving their economy and operation. A steam turbine plant in connection with a gas engine plant would practically insure the owners from expensive shutdowns.

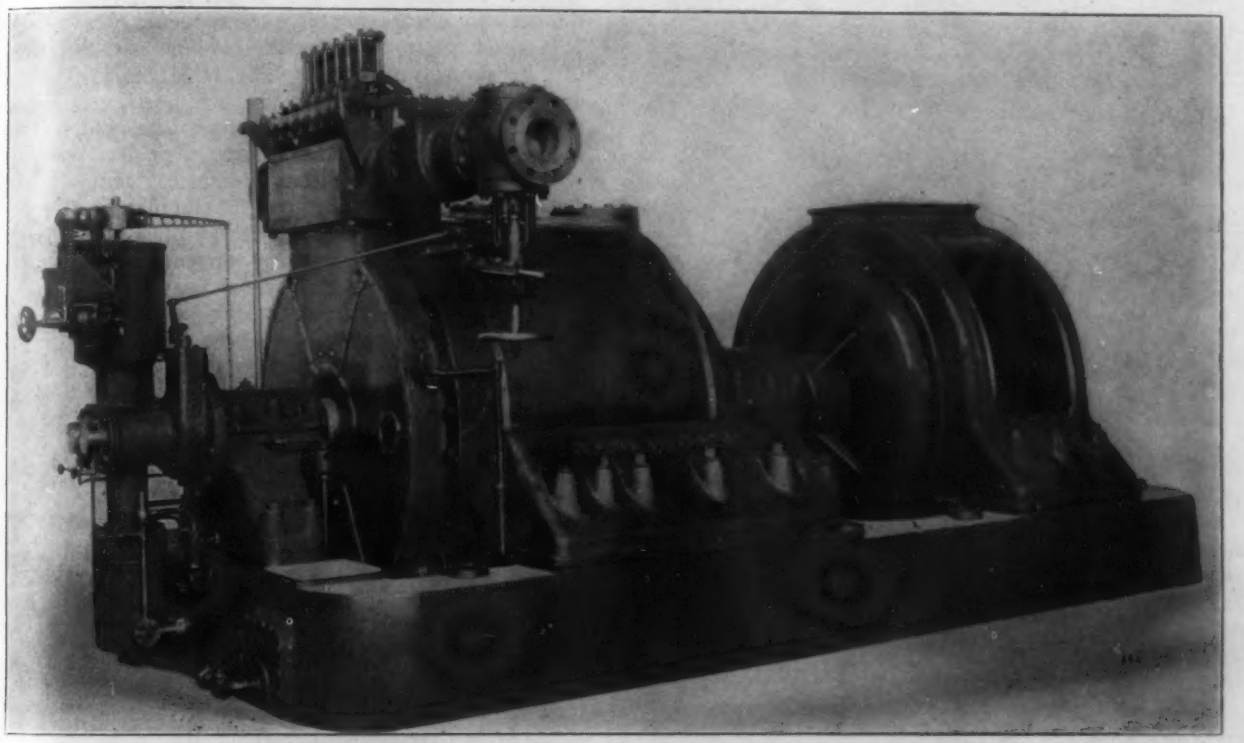
### Features of the Curtis Turbine

In the development of the Curtis turbine the General Electric Company has kept three points constantly in view—ruggedness, simplicity and high steam economy. The Curtis type of turbine allows the use of a comparatively small number of rugged parts with large clearance, thereby enabling the turbine to successfully withstand quick starting, shocks caused by water carried over with steam, and long and severe continuous service.

The turbine shaft is short and heavy and is made of nickel steel. The wheels are made of open hearth steel and securely mounted on the shaft. Large heavy buckets of noncorrosive material are dovetailed and accurately spaced in the wheel rims. The wheel rim protects the buckets on the inside, and a substantial shroud ring protects them on the outside. The turbine casing is heavy and well ribbed and carries the stationary buckets. The governing action is positive, and the mechanism exceedingly simple.

The same ruggedness is characteristic of the generator. The revolving field is composed of steel-punchings assembled directly on the shaft. The field coils are strip wound, and are protected and supported on the ends by nickel steel rings. The armature frame is very rigid, and the use of timbers to prevent springing of the frame is unnecessary. The armature coils are laid back at the ends and firmly fastened to insulated rings in the armature frame, thus preventing movement in case of short circuits.

The rotating parts of the turbine and generator are connected by a solid flange coupling, half of the coupling being forged to each shaft. The rotating parts are carried by liberally designed self-aligning bearings, which in turn are supported by low stocky standards. All the horizontal units for 500 to 7500 kw. capacity are built upon the same general principles. The illustration shows the appearance of all Curtis horizontal turbine generators.



A Horizontal Five-Stage Curtis Steam Turbine, 1000 Kw., 1800 Rev. per Min., 2300 Volts.

## The American Steel Foundries to Make Steel Wheels

The American Steel Foundries, Chicago, is making preparations to engage extensively in the manufacture of Davis cast steel car wheels. These wheels have been tested for the past six years on the leading railroads of the country on passenger and freight cars, as well as locomotives, with very satisfactory results.

The Davis wheel is cast in a sand mold, the molds being dried at even temperature under the regulation of special pyrometers. The tread of the wheel is manganese steel, of a quality corresponding to that used in manganese frogs and crossings, while the plate and hub are soft, low carbon, open hearth steel, the entire wheel being made in one casting.

In pouring a wheel the flask is mounted on a table which revolves while the metal is poured. The first metal to enter the mold is treated with ferromanganese in its passage from the ladle to the mold. The centrifugal action of the revolving table carries this metal out to form the tread of the wheel. When sufficient steel has been poured to form the tread, the ferromanganese treatment is omitted and the remainder of the wheel is cast with soft steel. The tread and flange thus have the composition of a very hard manganese steel, the manganese disappearing from the metal about 3 in. inward from the tread. After the hub is bored the wheel is mounted in a grinder, which grinds the tread and flange to a true circle. By this process of casting the Davis wheel it possesses the strength and safety of a forged wheel, combined with the very hard tread and flange of manganese steel. It is claimed that the flange is seven to eight times as strong as the flange of the average cast iron wheel.

# The Garvin No. 2-A Miller

## A New Universal Machine Possessing Important and Exclusive Features

In the design of its No. 2-A universal milling machine, the Garvin Machine Company, Spring and Varick streets, New York City, has endeavored to produce a machine capable of handling a wide range of work. Among its special features are a great increase in driving power, the transmission of the feed by the most direct means and the large size of the important parts. This machine is adapted for every class of tool and fixture making, general manufacturing, and as a special tool for the production of certain parts, such as fluted shafts, spiral and bevel gears and twist drills with a constant angle. Fig. 1 is a general view of the miller, Fig. 2 shows how it is possible to swivel

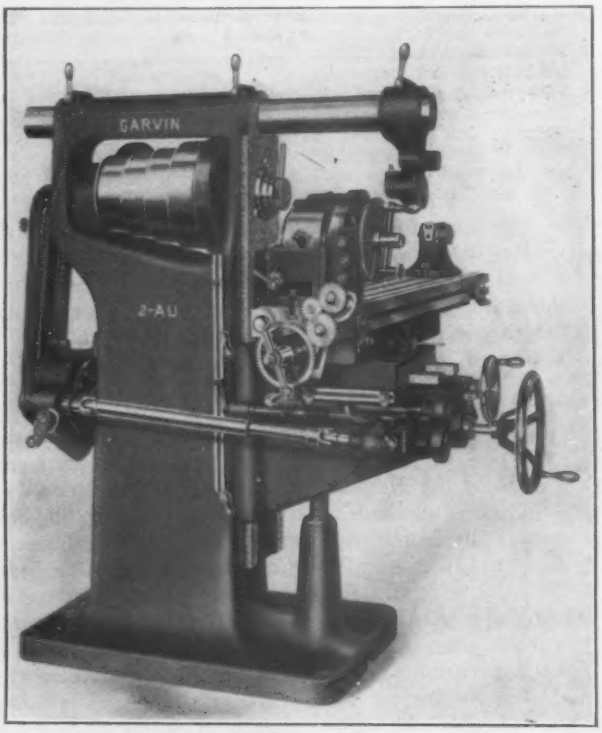



Fig. 1.—General View of the No. 2-A Universal Miller Built by the Garvin Machinery Company, New York City.

the table parallel with the knee and Fig. 3 gives the details of the positive feed change box.

The miller has power feed with automatic trip in all directions, and this is controlled by a single handle in the trip box on the side of the knee in front. In addition to this handle for starting, stopping and reversing the knee, the saddle or the slide, a second one determines which motion is to be active and prevents the knee and the saddle from being both thrown in at the same time.

The knee is closed solid on the sides and the top and the bearing on the column extends upward, thus increasing the holding power on the base. The advantages of this form of construction, which is covered by patents, are solidity and effectiveness and the prevention of spring and vibration under heavy loads. The elevating screw is of the telescoping type and has a ball thrust bearing. In the top of the knee are the square lock ways and the taper gib for the saddle, the guiding surfaces being placed centrally over the in and out screw. This gives a greater proportion of length to width in the guiding fit of the saddle on the knee and secures great accuracy of adjustment without tightness. All the operating handles on the knee are so located that when the latter is in its lowest position they are convenient for the operator to reach without stooping.

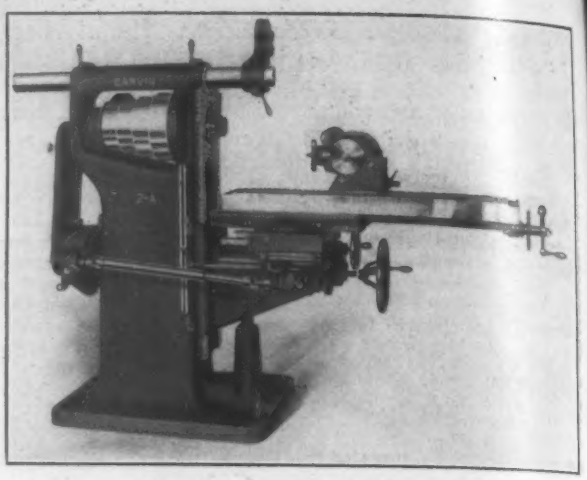


Fig. 2.—The Table Swiveled at Right Angles to Its Customary Position.

The table is wide and proportionately deep, the dimensions inside the oil pockets being 9 x 43½ in. If desired it can be swiveled into line with the spindle, as shown in Fig. 2. The table bearing in the swivel block is long, and has two taper gibs, while the block rests on a large circular base and is held to the saddle by four binder bolts. The feed screw is said to be larger than that ordinarily furnished and the increased torsional strength eliminates all jerky action in driving the dividing head on heavy spiral cutting, while the extra wearing surface afforded gives durability and added capacity for heavy work.

The gears for cutting spirals are arranged for single and double trains and the spirals obtainable include one turn in 1½, 2, 2½, 3 in., &c. When not in use these gears are hung on the inside of the column door. Special provision has been made for jig making and the micrometer adjustments give absolutely correct center distances in any direction between the holes. Holes at an angle are located as readily as any others, as the work can be clamped in the swivel vise and set to any horizontal or vertical angle desired. Thus it is possible to mill off the side of a jig at any predetermined angle, and the jig holes are then bored square to the angular surface at set distances without removing the work from the machine, as when a hole is once located power feed and automatic trip are provided for boring it.

A nickel steel sprocket chain transmits the feed from the end of the spindle to the feed change gear box, Fig. 3. Ten feed changes are available without stopping the machine, and this number is doubled when the back gears are used, thus making it possible for the operator to accelerate the feed of the table when using cutters of large diameter and the spindle is revolving slowly. The gears, which are of hardened steel, are submerged in oil and run on hardened studs, spaced at equal distances around the cylinder. A turn of the crank changes the feed, motion to the right increasing the feed, while a turn to the left decreases

Fig. 3.—Details of the Positive Feed Change Box.

it in approximately geometrical progression. These changes are read from a dial on the edge of the cylinder in either inches or millimeters per revolution, the rate in use appearing at the top.

The principal dimensions and specifications are given in the following table:

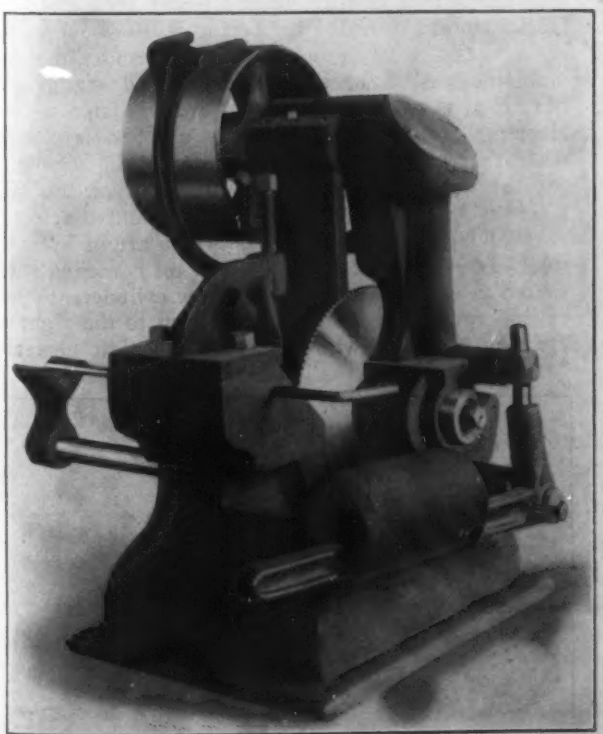
| | |
|---|---|
| Length of automatic table feed, inches | 25 |
| Table adjustment in line with spindle, inches | 8 |
| Vertical adjustment of table, inches | 18 |
| Overall dimensions of table, inches | 12¾ x 48 |
| Size of T slots in table, inches | ¾ |
| Maximum capacity between column and arm braces, in. | 21½ |
| Swing under arm, inches | 12½ |
| Taper in spindle, B. & S., No. | 10 |
| Width of belt, inches | 3 |
| Number of speed changes | 8 |
| Minimum speed, revolutions per minute | 10 |
| Maximum speed, revolutions per minute | 475 |
| Minimum feed, inch | 0.003 |
| Maximum feed, inch | 0.5 |
| Swing of centers, inches | 12 |
| Distance between centers, inches | 23 |
| Diameter of dividing head hole, inches | 1 1/16 |
| Diameter of friction countershaft pulleys, inches | 14 |
| Width of friction countershaft pulleys, inches | 4¼ |
| Minimum speed of friction countershaft pulleys, revolutions per minute | 110 |
| Maximum speed of friction countershaft pulleys, revolutions per minute | 320 |
| Floor space, inches | 74 x 84 |
| Domestic shipping weight, pounds | 3,500 |
| Foreign shipping weight, pounds | 3,950 |

The equipment regularly furnished with the miller includes all the accessories ordinarily supplied.

## The Improved Taylor-Schantz Metal Sawing Machine

The Taylor-Schantz Company, 230 Mill street, Rochester, N. Y., has improved its No. 2 metal sawing machine. This was done to produce an accurate and rapid cutting-off tool for light work that would be compact and simple in construction and by its economy of time and material displace the power hack saw. The small amount of bench space required, 22 x 22 in., enables it to be used in places where it would be at least inconvenient, if not impossible, to operate a machine that was not so compact.

The machine is designed and built along good mechanical lines and all wearing parts are both large and durable. The drive is through bevel gears of 10 pitch, having a ratio of 1½ to 1, to a large triple thread worm of 3 pitch. This worm has a ball bearing to take the thrust and meshes with a worm wheel, the teeth of which have been carefully hobbed. A gravity feed is used and is controlled by a weight lever. The weight is adjustable on the lever, and its position is varied as the saw dulls or for feeding different kinds of stock.



The No. 2 Metal Sawing Machine Built by the Taylor-Schantz Company, Rochester, N. Y.

The large diameter saw arbor is hardened and ground and is fitted into taper bearings. Minute adjustments are secured by nuts that take up any wear occurring in the bearings. The saw blade is made of a special semi-high speed steel and is 8 in. in diameter by 5-64 in. thick. The surface has constant relief from the center to the rim to give the necessary clearance. An oil bath serves to keep the saw blade cool and remove chips.

The following table gives the principal dimensions and specifications of the machine:

| | |
|---|---|
| Maximum width of bars handled, inches | 4¼ |
| Maximum thickness of bars handled, inches | 2 |
| Maximum diameter of rounds handled, inches | 2⅝ |
| Dimensions of base, inches | 12 x 15 |
| Diameter of saw, inches | 8 |
| Thickness of saw, inch | 5/64 |
| Diameter of driving pulleys, inches | 8 |
| Width of driving pulleys, inches | 2½ |
| Speed of driving pulleys, revolutions per minute | 200 |
| Net weight, pounds | 195 |
| Shipping weight, pounds | 240 |

The vise furnished with this machine is of the V-block pattern and the stock is clamped in place by a hardened screw. For duplicating work an adjustable gauge is provided that insures any desired number of pieces being cut to the same length without having to measure each one to insure uniformity.

**The National Machine Tool Builders' Convention Report.**—The official report of the ninth annual convention of the National Machine Tool Builders' Association, held in New York, October 25 and 26, has been sent out by Secretary Charles E. Hildreth, Whitcomb-Blaisdell Machine Tool Company, Worcester, Mass. The volume is an unusual one, exceptionally attractive typographically, and containing a great deal of interesting matter, including the full stenographic details of the convention. The events of the outing given by *Machinery* are set forth with reproductions of snapshot photographs, and a page is given up to an excellent verse set to the song, which made the hit of the *American Machinist's* theatre party. The volume contains 163 pages, a detailed index making its contents easily available. The report is more complete than ever, and its early receipt tells the story of the efficient efforts of Secretary Hildreth.

**New Rolling Mill at Ottawa, Ill.**—The Central Steel Company, Ottawa, Ill., recently incorporated, is building a rolling mill, which is expected to be ready for operation in January. The mill has four stands of rolls with an 8-in. finishing mill, and will be operated principally in rolling bar iron in small merchant mill sizes, using scrap as the raw material. The power is provided for by a 250-hp. A. C. motor, 2300 volts, using power obtained from a hydro-electric plant at Marseilles, 6 miles distant. This arrangement for power has relieved the company of the expense of installing a steam plant. The officers are: Fred L. Fisher, president and treasurer; L. P. Fisher, secretary; W. D. Wood, vice-president and general manager.

The J. E. Bolles Iron & Wire Works, Detroit, Mich., is working on a large contract for elevator inclosures and metal cars for the double elevators in the new Herpolsheimer Building in Grand Rapids, Mich. This work will be installed the last of December and the building occupied early in January.

# CURRENT METAL PRICES.

The following quotations are for small lots, New York. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market repo

## IRON AND STEEL—

### Bar Iron from store—

**Refined Iron:**

1 to 1¾ in. round and square ... ₩ lb 1.75¢
1½ to 4 in. x ⅜ to 1 in. ... ₩ lb 1.75¢
1½ to 4 in. x ½ to 5-16 ... ₩ lb 1.85¢
Rods—⅜ and 11-16 round and square ... ₩ lb 1.85¢

| Angles: | Cts ₩ lb |
|---|---|
| 3 in. x ¼ in. and larger | 2.00¢ |
| 3 in. x 3-16 in. and ⅛ in. | 2.25¢ |
| 1½ to 2½ in. x ⅛ in. | 2.10¢ |
| 1½ to 2¾ in. x 3-16 in. and thicker | 2.00¢ |
| 1 to 1¾ in. x 3-16 in. | 2.10¢ |
| 1 to 1¾ x ⅛ in. | 2.30¢ |
| ⅜ x ⅛ in. | 2.30¢ |
| ¾ x ⅛ in. | 2.40¢ |
| ⅝ x ¼ in. | 3.45¢ |
| ⅛ x 3-32 in. | 4.25¢ |

**Tees:**

1 in ... 2.65¢
1¼ in. ... 2.45¢
1½ to 2½ x ¼ in. ... 2.15¢
1½ to 2½ x 3-16 in. ... 2.35¢
3 in. and larger ... 2.05¢

Beams ... 2.00¢
Channels, 3 in. and larger ... 2.00¢
Bands—1½ to 6 x 3-16 to No. 8 ... 2.30¢
"Burden's Best" Iron, base price ... 3.15¢
Burden's "H. B. & S." Iron, base price ... 2.95¢
Norway Bars ... 3.60¢

### Merchant Steel from Store—

| | per lb. |
|---|---|
| Bessemer Machinery | 1.90¢ |
| Toe Calk, Tire and Sleigh Shoe | 2.50@3.00¢ |
| Best Cast Steel, base price in small lots | 7¢ |

### Sheets from Store—

Black

| | One Pass, C.R. Soft Steel. | R. G. Cleaned. |
|---|---|---|
| No. 16 | ₩ lb 2.55¢ | 2.80¢ |
| Nos. 18 to 20 | ₩ lb 2.70¢ | 2.90¢ |
| Nos. 22 and 24 | ₩ lb 2.75¢ | 3.00¢ |
| No. 26 | ₩ lb 2.80¢ | 3.10¢ |
| No. 28 | ₩ lb 2.95¢ | 3.30¢ |

### Russia, Planished, &c.

Genuine Russia, according to assortment ... ₩ lb 12 @14½
Patent Planished, W. Dewees Wood ... ₩ lb A, 10¢; B, 9¢ net.

### Galvanized.

Nos. 12 and 14 ... ₩ lb 2.95¢
Nos. 22 to 24 ... ₩ lb 3.30¢
No. 26 ... ₩ lb 3.50¢
No. 28 ... ₩ lb 3.80¢
No. 20 and lighter 36 inches wide, 25¢ higher.

### Genuine Iron Sheets—

Galvanized.

Nos. 22 and 24 ... ₩ lb 5.75¢
No. 26 ... ₩ lb 6.25¢
No. 28 ... ₩ lb 7.25¢

### Corrugated Roofing—

| 2½ in. corrugated. | Painted | Galvd |
|---|---|---|
| No. 24 | ₩ 100 sq. ft. $3.85 | 4.40 |
| No. 26 | ₩ 100 sq. ft. 2.95 | 4.00 |
| No. 28 | ₩ 100 sq. ft. 2.60 | 3.75 |

### Tin Plates—

American Charcoal Plates (per box.)

"A.A.A." Charcoal:
IC, 14 x 20 ... $6.35
IX, 14 x 20 ... 7.60
A. Charcoal:
IC, 14 x 20 ... $5.40
IX, 14 x 20 ... 6.50

American Coke Plates—Bessemer—
IC, 14 x 20 ... 107 lb ... $4.40
IX, 14 x 20 ... 5.40

American Terne Plates—
IC, 20 x 28 with an 8 lb. coating ... $8.50
IX, 20 x 28 with an 8 lb. coating ... 10.50

### Seamless Brass Tubes—

List November 17, 1908. Base price 18¢

### Brass Tubes, Iron Pipe Sizes—

List November 13, 1908. Base price 18¢

### Copper Tubes—

List November 13, 1908. Base price 21¢

### Brazed Brass Tubes—

List August 1, 1908. 19½¢ ₩ lb

### High Brass Rods—

List August 1, 1908. 14¾¢ ₩ lb

### Roll and Sheet Brass—

List August 1, 1908. 14¾¢ ₩ lb

### Brass Wire—

List August 1, 1908. 14¾¢ ₩ lb

### Copper Wire—

Base Price. Carload lots mill 14¾¢

### Copper Sheets—

Sheet Copper Hot Rolled, 16 oz (quantity lots) ₩ lb 18 ¢
Sheet Copper Cold Rolled, 1¢ ₩ lb advance over Hot Rolled.
Sheet Copper Polished 20 in. wide and under, 1¢ ₩ square foot
Sheet Copper Polished over 20 in. wide, 2¢ ₩ square foot
Planished Copper, 1¢ ₩ square foot more than Polished.

## METALS—

### Tin—

Straits Pig ... ₩ lb 33¼@33⅝

### Copper—

Lake Ingot ... ₩ lb 14⅜@15
Electrolytic ... ₩ lb 14⅜@14⅝
Casting ... ₩ lb 14¼@14⅜

### Spelter—

Western ... ₩ lb 6¼@6⅜

### Zinc.

No 9. base, casks ... ₩ lb 8¼¢ | Open ... ₩ lb 5¼

### Lead.

American Pig ... ₩ lb 5 @5¼¢
Bar ... ₩ lb 6¼@6½¢

### Solder.

½ & ½, guaranteed ... ₩ lb 21½@21¾ ¢
No. 1 ... ₩ lb 21½@22 ¢
Refined ... ₩ lb 19 @19½¢
Prices of Solder indicated by private brand vary according to composition.

### Antimony—

Cookson ... ₩ lb ... @16¢
Hallett's ... @15¢
Other Brands ... @9½¢

### Bismuth—

Per lb. $2.00@$2.25

### Aluminum—

No. 1 Aluminum (guaranteed over 99% pure), in lots for remelting ... 31¢
Rods & Wire ... Base Price 31¢
Sheets ... Base Price 33¢

### Old Metals.

*Dealers' Purchasing Prices Paid in New York*

| | Cents |
|---|---|
| Copper, Heavy cut and crucible | ₩ lb 11.00@11.25 |
| Copper, Heavy and Wire | ₩ lb 10.75@11.00 |
| Copper, Light and Bottoms | ₩ lb 9.75@10.00 |
| Brass, Heavy | ₩ lb 7.25@ 7.50 |
| Brass, Light | ₩ lb 6.75@ 6.90 |
| Heavy Mechine Composition | ₩ lb 9.75@10.00 |
| Clean Brass Turnings | ₩ lb 7.25@ 7.50 |
| Composition Turnings | ₩ lb 8.25@ 8.50 |
| Lead, Heavy | ₩ lb ... @ 4.75 |
| Lead, Tea | ₩ lb ... @ 3.50 |
| Zinc Scrap | ₩ lb ... @ 4.00 |

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Time is not the only saving effected through the use of Nicholson Files.
Their hard cutting surface and perfect temper gives them a lasting quality that makes them by far the most economical of all files to use.
Our Catalog shows what styles to use. Our book, "File Filosophy," tells how best to use them.
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